CANOTIA
VOLUME 10

Vegetation and Flora of the McDowell Sonoran Preserve, Maricopa County, Arizona

Steve Jones and Chelsey Hull 1

New Records for the Flora of Arizona

Walter Fertig 35

December 2014
Vascular Plant Herbarium
School of Life Sciences, Arizona State University

QK
188
.J65
2014

CANOTIA

Editor: Leslie R. Landrum
P. O. Box 874501
School of Life Sciences
Arizona State University
Tempe, AZ 85287-4501
(les.landrum@asu.edu)

Associate Editor: Orbelia R. Robinson
Botany Department
California Academy of Sciences
875 Howard Street
San Francisco, CA 94103-3009
(orobinson@calacademy.org)

Production Editor: Shannon C. Doan
College of Letters and Sciences
Arizona State University
7001 E. Williams Field Road
Mesa, AZ 85212
(sdoan@asu.edu)

ESTHER T. MERTZ LIBRARY
DEC 23 2014
NEW YORK BOTANICAL GARDEN

Printed copies of this issue are being made possible through a grant from the Arizona Native Plant Society. An introduction to the Vascular Plants of Arizona project can be found in Canotia volume 1, issue 1.

Canotia publishes botanical and mycological papers related to Arizona. These may include contributions to the Vascular Plants of Arizona project, checklists, local floras, new records for Arizona and ecological studies. All manuscripts are peer-reviewed by specialists. Acceptance for publication will be at the discretion of the editor. At least 30 printed copies of each issue are distributed to libraries in the United States, Europe, and Latin America. Anyone may download copies free of charge at http://www.canotia.org.

Canotia is named for *Canotia holacantha* Torr. (Celastraceae), a spiny shrub or small tree nearly endemic to Arizona. Illustration by Alandon Joe.

ISSN 1931-3616

MERTZ LIBRARY
NEW YORK
BOTANICAL
GARDEN

VEGETATION AND FLORA OF THE MCDOWELL SONORAN PRESERVE, MARICOPA COUNTY, ARIZONA

Steve Jones and Chelsey Hull

McDowell Sonoran Conservancy
16345 N. Scottsdale Rd.
Suite 110
Scottsdale, AZ 85254

ABSTRACT

This study is part of an effort to establish a baseline assessment of the biotic condition of the City of Scottsdale's McDowell Sonoran Preserve. The study area is in northeastern Scottsdale and includes the McDowell Mountain range and areas to the north of the range. In total, 379 taxa in 61 families were identified between February 2011 and September 2013. The McDowell Sonoran Conservancy's Field Institute trained volunteer citizen scientists to participate in collecting specimens for the study. Seedbank samples were collected and cultivated in a greenhouse to simulate a wet spring season. Plant families with the largest presence in the preserve include Asteraceae (65 taxa), Poaceae (49), Fabaceae (19), Boraginaceae (22), and Cactaceae (17). Major biotic communities were identified and described.

INTRODUCTION

In 1995 and 2004, the citizens of the City of Scottsdale approved taxation mechanisms for funding the purchase of the McDowell Mountains and surrounding lands. As the land was assembled, the City designated it the McDowell Sonoran Preserve (MSP). Assemblage of the preserve is ongoing. This study is part of a larger baseline assessment of the biotic condition of the MSP, and of land under consideration for addition to the MSP. Assessments of arthropods, reptiles, birds and mammals were undertaken at roughly the same time. The studies were organized under the auspices of the McDowell Sonoran Field Institute (MSFI), the research center of the McDowell Sonoran Conservancy (MSC). These studies were cooperative efforts between the City of Scottsdale, the MSC and a number of local research and educational institutions. All of the studies utilized volunteer help from the large group of stewards organized and trained by the MSC and scientific partners. This study also included two student interns employed by the MSC. An Arizona State University student, Brenton Scott, participated in collecting the first year and mounted specimens at Arizona State University Herbarium (ASU). A Scottsdale Community College student, Chelsey Hull, participated in collecting throughout the study, mounted specimens at the Desert Botanical Garden Herbarium (DES), maintained the seed bank study, and is the second author of this paper.

Vegetation and Flora of the McDowell Sonoran Preserve, Maricopa County, Arizona. *CANOTIA* 10:1-34. 2014. ©S. Jones and C. Hull.

2/30/14 C1554 C/S

STUDY AREA

Overview—The study area (Fig. 1) includes land already acquired by the City of Scottsdale and land designated for future acquisition from the Arizona State Land Department. As of 2013 the City owns 11,250 hectares (27,800 acres). The goal of the city is to preserve approximately 13,760 hectares (34,000 acres) in total, which amounts to about 25% of the city's land area. The current and planned MSP lands fall entirely within the rectangular area between 33.59N to 33.82N and 111.76W to 111.93W. A 260 hectare (640 acre) section of land in the northwestern portion of the study area was privately held and developed prior to formation of the MSP. A small site for communications relay equipment on Thompson Peak is not included in the MSP. Elevations in the MSP range from 515 meters (1690 feet) southwest of the Lost Dog Wash access area to 1237 meters (4059 feet) at East End.

Geomorphology, geology and soils—The MSP is located at the northeastern limit of the Basin and Range Province of southern and western Arizona, near its boundary with the Central Mountain Province (Nations and Stump 1981). The southern MSP includes the McDowell Mountain range and material eroding from it; the northern MSP is a portion of the larger Pinnacle Peak Pediment that extends to the northwest, west and east of the MSP (Fig. 2A). The oldest rocks are exposed in the mountain range, and consist of Proterozoic metamorphic quartzites, andesites and rhyolites with minor volcanic material. Granitic magma intruded these rocks about 1.4 billion years ago. This material makes up the granite exposures in the northeast range, and also most of the Pinnacle Peak Pediment to the north (Skotnicki 1996). All this material was exposed by erosion after a regional uplift between 38 and 33 million years ago (Doorn and Péwé 1991). Late Tertiary volcanic activity between 22 and 13 million years ago produced basaltic and tuffaceous flows atop a portion of the Pinnacle Peak Pediment, remnants of which make up Brown's Mountain, a conspicuous ridge northeast of it, and the core of Cone Mountain (Doorn & Péwé 1991). The McDowell Mountain range formed by block faulting during the Basin and Range Disturbance between 15 and 12 million years ago (Nations and Stump 1981).

Camp (1986) noted two general soil types for the MSP area. On the higher and middle slopes are Gran-rock outcrop-Lehmans soils: very shallow to shallow soils, well-drained alluvium and colluvium. The surface is very gravelly and loamy; subsoils are very gravelly and clayey. On the lower slopes surrounding the range and on the Pinnacle Peak Pediment are Eba-Pinaleno soils: deeper, well-drained alluvium. The surface is very gravelly and loamy; subsoils are very gravelly and loamy or clayey.

Climate—Central Arizona's climate regime includes two rainy seasons with intervening dry periods. The winter-spring rainy period (December-March) is driven by intermittent flows of moist air from the Pacific Ocean. April through June is generally very dry; June can be quite hot. The second rainy season runs from late June to mid-September; unsettled moist, tropical air from the south produces afternoon and evening thundershowers and occasionally heavy thunderstorms. October through December is usually dry, though remnants of Pacific hurricanes occasionally produce heavy rains (Dimmitt 2000).

The Flood Control District of Maricopa County maintains four weather stations and nine functional rain gauges in or near the MSP. The average yearly temperature

among the four stations from 2001 through 2012 was 71°F with a range between 17°F and 118°F. The average precipitation for the nine rain gauges between 2001 and 2013 was 9.1 inches across the preserve. Rainfall amounts were higher in the northern area than the southern area, as represented by 1991-2010 averages of 11.9 inches at Fraesfield Mountain in the north and 7.6 inches at Lost Dog Wash in the south (Flood Control District of Maricopa County 2013). Through the course of the study, rainfall at all stations was about 2/3 of average in 2011, about 1/3 of average in 2012, and slightly above average in 2013.

Vegetation—The vegetation in the MSP primarily consists of desert scrubland dominated by small, spreading trees, shrubs of various sizes, and cacti. The MSP falls entirely within the area mapped by Brown and Lowe (1982) as the Arizona Upland subdivision of the Sonoran desertscrub. Numerous plant associations have been noted in the MSP, but three associations account for the majority of the area. *Ambrosia deltoidea-Parkinsonia microphylla*-mixed scrub prevails across most slopes of the mountain range and across the bajada in the southern preserve, and on the western portion of the Pinnacle Peak Pediment in the northern preserve. *Carnegiea gigantea, Cylindropuntia acanthocarpa*, *Encelia farinosa*, and *Olneya tesota* are common members of this community. On higher elevation, eastern portions of the Pinnacle Peak Pediment, *Ericameria laricifolia* generally replaces *A. deltoidea* as the dominant shrub. The mixed scrub component here includes more species— *Acacia greggii*, *Bahiopsis parishii*, *Ephedra aspera*, *Eriogonum fasciculatum*, *Eriogonum wrightii*, *Lotus rigidus*, *Lycium exsertum*, *Yucca baccata* and others. The third common association is *Simmondsia chinensis*-mixed scrub. It is common on north-facing slopes in the mountain range, on the northern bajada, and in two large portions of the northern MSP.

South of Cholla Mountain is an area following a geological fault line characterized by heavy development of caliche (see Fig. 1). The area is also characterized by numerous large specimens of *Canotia holacantha* (Fig. 2C). The most common species here are similar to those listed in the Lime Creek area 15 miles to the northeast by Goldman and Ward (2010). Though the areas are unlikely to be geologically related, both have high levels of calcium carbonate in the soil.

Disturbances—Two major lightning-caused fires heavily affected the vegetation of the MSP in recent history. In 1992, the Granite fire burned approximately 2000 acres between the power lines from the Navajo generating station and the Alma School Road alignment, from the Brown's Mountain area south to the Jomax Road alignment. In 1995, the Rio fire burned about 5000 acres of the MSP from Fraesfield Mountain south to Windgate Pass north of McDowell Peak, including the East End and Tom's Thumb areas.

A human-caused fire passed through the northwestern corner of the study area outside of the MSP in 1992. Another human-caused fire in the Lost Dog Wash area, known as the Ancala fire, occurred in 1993. Approximately 250 acres burned, principally in Lost Dog Wash and on the east-facing slope to the west.

Cultural history—Human utilization of resources in the area including the MSP was likely transitory from the Paleo-Indian period through the Early and Middle Archaic periods. Late Archaic period (ca. 1500 BCE–150 CE) remains are relatively abundant in the upland areas including the McDowell Mountains, while they are absent from the lower reaches of the Phoenix Basin (Wright 2002). Plant and animal resources

are likely to have been more diverse in the upland than in the basin, as they are today. Natural springs and raw materials for tools from geological sources also made the area attractive.

Hohokam culture made substantial use of resources in the McDowell Mountains and surrounding area. Evidence of all periods of Hohokam culture exists in the MSP. There is little evidence of plant cultivation within the MSP. However, in 1994 Wendy Hodgson collected a specimen from a single clonal group of *Agave murpheyi* east of McDowell Peak (*Hodgson 8102*, ASU and DES) (Fig. 2B). This species is uniquely associated with pre-Columbian cultivation, and is not found in natural vegetation per se (Hodgson 2001).

After the collapse of the Hohokam culture, Yavapai people occupied the area as hunter-gatherers, in a similar manner as the Late Archaic people (Wright 2002). They established temporary resource procurement and food processing sites, some of them on former Hohokam facilities. In the case of the Brown's Ranch rock shelter site in the MSP, a continuous record of use has been traced from the Late Archaic through the Yavapai people, from ca. 1500 BCE to the 1860s CE.

Euro-American settlement began in the 1860s. Mining and ranching were the primary draws to the area. These activities disrupted the Yavapai's access to water sources and other resources. Some Yavapai took up raiding as a means of compensating themselves for the loss. As a result, a US Army site, Camp McDowell, was established in 1865 along the Verde River to the east of the modern MSP. After the Fort McDowell Mohave-Apache Reservation (now the Fort McDowell Yavapai Nation) was established in 1904, mining and ranching began in earnest (Wright 2002).

Several ranches operated in and near what is now the MSP. Edwin (E. O.) Brown, who also owned the nearby DC Ranch, operated Brown's Ranch northeast of Brown's Mountain beginning as early as 1916. Many of the structures developed there remain today. Miguel Ochoa established a ranch site in a canyon southwest of the current Tom's Thumb trailhead in 1919, receiving a patent for the land in 1924. The Ochoa land later became part of William W. Moore's X2 Ranch. The remnant structures in the area include a well and cistern in the canyon, with irrigation pipe leading northeast to at least two other cattle watering stations on X2 Ranch land, and now within the MSP (Jones 2012).

Windmill Pasture, with a well and other ranching facilities, is in the MSP near the eastern boundary. It was developed as a part of the Pemberton Ranch centered in what is now the McDowell Mountain Regional Park.

As the Phoenix metropolitan area developed, the area was increasingly utilized for recreational activities, from hiking and horseback riding to hunting to motorcycle riding. These activities established many informal trails in the northern area. The City of Scottsdale is incorporating some of these into a new trail system, and is closing most others. Bird hunting was a popular activity as evidenced by the near-ubiquitous shotgun hulls well-distributed across the northern preserve.

METHODS

Taxonomic scope—Collections were limited to vascular plants. Most specimens were identified using *Arizona Flora* (Kearney & Peebles 1960). Many taxa

were identified or confirmed using updates and revisions from the Vascular Plants of Arizona (VPA) Project (Vascular Plants of Arizona Editorial Committee 1992+). The *Flora of North America* (FNA) Project was used for the families treated therein (Flora of North America Editorial Committee 1993+). Native status was determined for each species using the United States Department of Agriculture PLANTS database (USDA 2013). Nomenclature follows the VPA Project and FNA Project; for taxa not covered by either treatment, USDA PLANTS was used.

Herbarium search—A search of local herbaria for material collected within the boundaries of the preserve was greatly facilitated by the Southwestern Environmental Information Network (SEINet). SEINet includes an internet-searchable database of collections in herbaria in much of the southwestern United States and northern Mexico. A search for catalogued specimens from within a geographic area including the preserve (33.59N to 33.79N and 111.76W to 111.86W) resulted in a list of 209 taxa. Meredith Lane collected most of them in the mid-1970s from the McDowell Mountain Regional Park, a Maricopa County park immediately adjacent to the preserve to the east (see Lane 1981).

A more directed search for locations within the MSP resulted in 22 specimens, all in ASU, with a few duplicates in DES or the University of California at Riverside (UCR) herbarium. These are listed in Appendix A.

Collection methods—One goal of the MSFI was to involve interested members of the large group of volunteer MSC stewards in the studies. For this study, eighteen stewards were trained in plant collection methods. Six of these and the two interns were given further training in data-collection procedures and were designated "lead collectors." They were responsible for noting the location of each collection including global positioning system (GPS) information on coordinates and elevation, descriptions of the plants collected, listing known species at the collection location, date, and names of other team members. GPS units were set to WGS94 map datum, decimal format for coordinates, and metric elevation settings.

Nearly 100 collecting trips were made over the course of the study from February 2011 through September 2013. Most were individual or small group efforts, but MSC organized seven biweekly outings between February and May 2011 utilizing the existing trail system, during which lead collectors and volunteer stewards surveyed all public trails within the preserve. Most of the specimens were collected during this season.

SEINet provided another valuable tool used in the study: the ability to produce and maintain checklists. Several were developed through the course of the study. One checklist tracked taxa as they were collected and identified. Checklists of uncollected spring ephemerals and summer ephemerals served as "lookout lists" in season. MSC stewards and interns were provided with training in the use of the SEINet resources.

Collections were taken by permit only from land owned by the City of Scottsdale. A restriction on collecting plants from populations with fewer than 20 individuals affected nine taxa; these were photo-vouchered. No specimens were taken from Arizona State Trust lands in the study area or from land outside of the study area.

Material was pressed and dried using standard equipment and procedures (Harrington 1957). Vouchers were distributed to ASU and DES where they were mounted and deposited in their collections. Material collected by the steward lead

collectors was sent to DES. Material collected by the student interns and Steve Jones was sent to ASU. Duplicate material, when available, was distributed by ASU and DES. Additional material was given to the Scottsdale Community College herbarium.

Greenhouse seed bank methods—After 2 years of surveying the spring flora in poor rainfall regimes, the McDowell Sonoran Field Institute initiated an effort to sample the seed bank within the preserve. The seed bank study began in November 2012 and ended in August 2013. The methods were modeled after the seed bank study for Hummingbird Springs Wilderness (Lund 2011). Use of the Scottsdale Community College greenhouse (Fig. 2F) permitted controlling the climate to produce optimal conditions for germination. Soil was collected from 23 sites across the preserve. Some of these sites were chosen specifically to capture undocumented species noted in previous years, while others were chosen to account for range in elevation and microclimate across the preserve.

At each site, three samples were collected. One was taken from a location exposed to sunlight, another from a sheltered location, and a third from an area of interest (*e.g.* harvester ant trash pile, alongside a boulder, or a wash). Approximately 15 cm × 15 cm of soil was collected for each sample, taking only the top 2 centimeters. Each sample was planted in two trays, resulting in six trays per site. Tray size was 17 cm by 12 cm by 5.5 cm deep. A medium (2:1 mix of sterile soil to pumice) was placed 4 cm deep in a sterile tray and the sample soil was spread 1 cm deep over this medium. In order to control for plants that may have originated in the greenhouse, 12 sterile trays were filled with sterile medium and given the same water, light, and temperature conditions as the preserve soils. All trays were watered automatically 3 minutes twice a day to keep soil moist and allow for quick germination. Plants were grown until mature enough to identify. Specimens new to the preserve species list were allowed to grow to maturity and were collected, pressed and mounted. Voucher specimens of collected species are housed in the ASU herbarium.

RESULTS AND DISCUSSION

Plant collections—Field collections produced 742 specimens over the 32-month period of the study from February 2011 to September 2013. An additional 11 specimens were collected and pressed from the greenhouse seed bank trays. In total, 368 species were collected, including 3 interspecific hybrids. Identifiable characteristics within 8 species yielded an additional 11 taxa. Collections represented 237 genera and 61 families (Table 1). Five families accounted for 44% of species. These were: Asteraceae (64 species in 46 genera), Poaceae (44 species in 28 genera), Boraginaceae (21 species in 9 genera), Fabaceae (19 species in 12 genera), and Cactaceae (15 species in 7 genera).

The 8 species with multiple discernible subspecific taxa are *Aristida purpurea* (4 varieties), *Lycium andersonii* (3 varieties), *Hordeum murinum* (2 varieties), *Vulpia microstachys* (2 varieties), *Cylindropuntia acanthocarpa* (2 varieties), *Opuntia engelmannii* (2 varieties), *Eriogonum fasciculatum* (2 varieties) and *Cryptantha pterocarya* (2 varieties).

Two cacti are of hybrid origin, *Opuntia* ×*curvospina* and *Cylindropuntia* ×*tetracantha*. Additionally, one putative hybrid plant was found, *Ambrosia*

ambrosioides × *A. salsola* (Fig. 3A). Eriophyid mite galls on the leaves of the plant (Fig. 3B) suggest its relation to *A. ambrosioides*; the mite galls are commonly found on its leaves. This combination has been reported from three other locations. One specimen was found in Sabino Canyon, Pima County (*Van Devender 90-47*, ASU; *Van Devender 91-524* and *91-525*, ARIZ) and another on the Barry M. Goldwater Military Range, Maricopa County (*Felger 03-17-A*, ASU). Baldwin et al. (1996) report a third from South Mountains (*M. Butterwick and T. Daniel 8874*, CAS); Daniel and Butterwick (1992) name this specimen as an unidentified *Ambrosia*, "a hybrid or aberrant form."

Three species were new records for Maricopa County: *Allionia choisyi*, *Astrolepis windhamii*, and *Portulaca pilosa* (Figs. 3C, 3D and 3E). Two others, *Ipomoea hederacea* and *Portulaca umbraticola*, have only otherwise been collected from the Sonoran Desert National Monument in southern Maricopa County.

Ephemeral plants make up 43% of the species identified. Of these, 130 (35%) are spring ephemerals, and 30 (8%) are summer ephemerals. Perennials with prolonged dormancy are not included as ephemerals.

Due to insufficient material in the field, nine species were not collected, though photo vouchers and location information are posted on the SEINet web site under general observations. *Dudleya saxosa* var. *collomiae* was found in three locations on the higher rocky slopes in quartzite exposures. Marianne Jensen found and photographed a pair of *Sairocarpus nuttallianus* plants east of Tom's Thumb in 2011; four plants were seen in the same location in 2013. A single occurrence of *Cheilanthes wrightii* on the Pinnacle Peak Pediment, one of two specimens of *Cynanchum arizonicum* at Lookout Point south of Tom's Thumb, and a pair of fruiting *Portulaca umbraticola* along the Tom's Thumb trail were photo-vouchered as well. Melanie Tluczek found, geolocated and photographed two taxa of *Oenothera*; in April 2013 she found *O. elata* ssp. *hirsutissima* on state land soon to be included in the preserve, and the following month found *O. primiveris* along a newly cut trail on the southeast flank of Brown's Mountain. A single *Helianthus annuus* was found in the Black Hill Tank sediments northeast of Fraesfield Mountain in the spring of 2013. It is likely to have originated from commercial birdseed; the single, immature inflorescence was about 10 cm across and the leaves and stem were much larger than the native specimens known from agricultural areas and washes in the region. In the last week of field work for the study, a sharp-eyed Liz Makings found and photographed a small group of *Kallstroemia parviflora* in a low area along a wash on the northeast slope of Brown's Mountain. *Agave deserti* var. *simplex* is found in the east-central area of the McDowell Mountain range. Several were geolocated and photographed, but attempts to collect it in flower were not successful; a SEINet photo voucher is included to document its presence. In November 2013 a leaf voucher was collected and sent to ASU.

Two additional rarely encountered species, *Layia glandularia* and *Loeflingia squarrosa*, are represented by field photographs mounted with labels and housed at ASU.

No taxa listed as threatened or endangered by the US Fish and Wildlife Service were encountered in the course of the study.

Herbarium search and collections—In 1967 Don Cates collected 19 specimens from the McDowell Peak area; all were deposited at ASU. Of these,

Glandularia bipinnatifida var. *bipinnatifida* was not re-collected in this study. Duplicates of three of these, and an additional specimen of *Plagiobothrys arizonicus*, are housed at the University of California herbarium (UCR). A specimen of *Mentzelia involucrata* was collected in 1975 by R. Smith, south of McDowell Peak (ASU); the species was not recollected in this study. All ASU material was reviewed.

In 1994, Wendy Hodgson collected *Agave murpheyi* and *Hilaria belangeri* east of McDowell Peak (ASU and DES). Both were confirmed in November 2013 by photo voucher. In addition, in 1988 Steve Jones collected 18 species in the Brown's Mountain area; of these, only *Marrubium vulgare* was not re-collected. See Appendix A for the full list of previous collections.

The search of SEINet records of the rectangular area around the preserve resulted in a list of 209 taxa previously collected. Of these, 17 taxa were not re-collected. Four of these were associated with stock tanks in the McDowell Mountain Regional Park.

Greenhouse results and discussion—All samples of soil collected from the preserve contained viable seed. A total of 47 taxa were identified in the study, 8 of which were new to the preserve checklist as of 2012. Of these, 6 were collected from the field during the spring 2013 collection season; *Conyza canadensis* and *Juncus bufonius* were not found in the field. The control group had zero germination indicating that all collected plants originated in the preserve. The seed bank study was conducted in hopes of adding plants known to occur in the preserve in more productive rainfall regime years. This goal was accomplished with the germination and identification of species such as *Daucus pusillus* as well as some unexpected species such as *Juncus bufonius* (Fig. 3F).

Crassula connata was rarely seen in the field during the survey, but grew in 26 of the 138 trays planted (19%), occasionally in substantial numbers. Presumably, its very small size is in part responsible for the lack of field observations. Conditions in the greenhouse may have been ideal for it as well. In contrast, *Pectocarya recurvata* is a ubiquitous spring ephemeral in the MSP, but was completely absent from the greenhouse trays. Future seed bank studies could be improved or expanded by adding another season of soil collection as well as varying climate conditions in the greenhouse or performing various sorts of stratification.

Non-natives—Most species are native to North America, but 30 of the 368 species (8%) are non-natives introduced from other continents (USDA 2013). Of these, most originated in temperate areas of the Old World, primarily in the Mediterranean region and southwestern Eurasia. Thirteen non-native species are in the family Poaceae. Ephemerals make up 27 of the 30 non-native species.

Five species are potentially invasive in the MSP: *Brassica tournefortii*, *Centaurea melitensis*, *Oncosiphon piluliferum*, *Pennisetum ciliare* and *P. setaceum*. Other non-native taxa are naturalized; they are thoroughly inculcated in the upland and riparian biotic communities. Ephemerals *Bromus rubens*, *Erodium cicutarium*, *Schismus arabicus* and *S. barbatus* are widespread and well-established. *Erodium cicutarium* is known to have been present in California before 1769 (Mensing and Byrne 1998). *Bromus rubens* was introduced in California in the mid-19th Century (Salo 2005). The two *Schismus* species were first reported in the state in 1926 (Van Devender and Dimmitt 2000).

Incidental introductions—Three perennial and two ephemeral species were accidentally or deliberately introduced into the MSP in recent years. North of the Legend Trails subdivision, two well-established specimens of *Opuntia engelmannii* var. *linguiformis* are growing near a paved road; they likely originated from stems dumped as landscaping debris. A single *Agave americana* is growing near the old well and cistern in Ochoa Canyon north of Tom's Thumb. Its origin is unknown. Two *Senna artemisioides* shrubs are growing in the eastern preserve, one along the East End trail about ¼ mile north of Windmill trail; another is growing near the base of Tom's Thumb. Their origin is also unknown.

Two ephemeral species of *Portulaca* were seen along the Tom's Thumb trail in the summer of 2012. *Portulaca pilosa* was collected near the junction with Lookout Trail, and *P. umbraticola* was photographed about 0.2 mile northeast of that location. Both have tiny seeds and were likely introduced from hikers' clothing or shoes.

Disturbances—The first author has been familiar with the northern preserve for almost 30 years and observed as the area recovered from the fires of the 1990s. Some shrub species demonstrated an ability to quickly recover from fire by producing new shoots from ground-level crowns. This group includes *Acacia greggii*, *Larrea tridentata*, *Lycium* spp., *Quercus turbinella*, *Simmondsia chinensis*, and smaller shrubs such as *Ambrosia* spp., *Bahiopsis parishii, Ericameria laricifolia*, and *Eriogonum* spp. *Yucca* spp. have growth points protected from fire and many survived. In contrast, most cacti, *Ephedra aspera*, *Fouquieria splendens* and *Parkinsonia* spp. were much reduced in burn areas. *Canotia holacantha* were also much reduced, though their prior presence is memorialized by a curious feature. The wood just beneath the bark remained unburned while the inner trunk was hollowed out by fire, leaving numerous thin-walled, tube-like trunks still standing 20 years after the fires (Fig. 2D).

Peniocereus greggii is the one cactus that survived fire due to its large taproot. Most of the 35 *Peniocereus* plants found during the survey are in areas burned in the 1995 Rio fire. The thinning of supporting shrubs left some *Peniocereus* in the open and relatively easy to locate (Fig. 2E).

In the area burned by the 1993 Ancala fire, cacti and *Parkinsonia microphylla*, common in the surrounding area, were nearly eliminated. *Encelia farinosa*, present as a member of the mixed scrub in the surrounding vegetation, quickly filled the area and dominates the burn area twenty years later, especially the east-facing slope.

Table 1. Taxonomic composition of field and greenhouse collections from the MSP.

Taxonomic group	Families	Genera	Species	Taxa
Lycopodiophyta	1	1	1	1
Pteridophyta	1	5	9	9
Coniferophyta	1	1	1	1
Gnetophyta	1	1	1	1
Magnoliophyta	57	229	356	367
Magnoliopsida	*52*	*194*	*301*	*307*
Liliopsida	*5*	*35*	*55*	*60*
Totals	61	237	368	379

CATALOG OF THE VASCULAR PLANTS OF THE MCDOWELL SONORAN PRESERVE

Taxa are arranged by phylum, with the phylum Magnoliophyta divided into classes Magnoliopsida and Liliopsida (see Table 1). Subsequent ranks are listed alphabetically. Family names are taken from the Angiosperm Phylogeny Group III (APGIII) classification system (Stevens 2014); several synonyms are included with direction to the relevant APGIII family.

Annotations for each taxon include scientific name [relevant synonym if any]; common name; life form; extent of presence in MSP and relative abundance where present; location or other notes; observed elevation or elevation range (in meters) within the MSP; and collector number(s). An asterisk (*) indicates a species introduced to North America. Common names are generally the first name listed in each taxon's SEINet entry. Values for extent of presence are: widespread, frequent, local or scarce. Values for relative abundance are: abundant, common, occasional, uncommon or rare. Collectors are listed by initials; names and the herbarium in which each collector's material is deposited are listed in Appendix B. "(G)" appended to a collection number refers to a greenhouse collection. Photos sine numero (s.n.) are posted in the General Observations collection on SEINet.

LYCOPODIOPHYTA

Selaginellaceae

Selaginella arizonica Maxon. Arizona spikemoss. Lycopod. Widespread, occasional. 584–1169 m. *SJ1359, JP24.*

PTERIDOPHYTA

Pteridaceae

Astrolepis cochisensis (Goodding) Benham & Windham ssp. *cochisensis*. Cochise scaly cloakfern. Fern. Local, rare; rocky slopes. 584–592 m. *SJ1362.*

Astrolepis sinuata (Lag. ex Sw.) Benham & Windham. Wavy scaly cloakfern. Fern. Scarce, rare; rocky slopes. 690 m. *JP22.*

Astrolepis windhamii Benham. Windham's scaly cloakfern. Fern. Scarce, rare; single colony in large boulder exposure near Cholla power line. New Maricopa County record; out of reported range and elevation. 747 m. *SJ1684, SJ1711.*

Cheilanthes covillei Maxon. Coville's lipfern. Fern. Widespread, occasional; shady, rocky areas. 690–1118 m. *DG4.*

Cheilanthes parryi (D. C. Eaton) Domin. Parry's lipfern. Fern. Local, rare; shady, rocky areas. 695 m. *SJ1614.*

Cheilanthes wrightii Hook. Wright's lipfern. Fern. Scarce, rare; large boulder exposure near Cholla power line. 744 m. *SJ s.n.* (photo).

Notholaena standleyi Maxon. Star cloak fern. Fern. Local, uncommon; shady, rocky areas. 632–686 m. *BP24.*

Pellaea truncata Goodding. Spiny cliffbrake. Fern. Widespread, occasional; rocky areas. 854–1090 m. *DG20.*

Pentagramma triangularis (Kaulf.) Yatsk., Windham & E. Wollenw. ssp. *maxonii* (Weath.) Yatsk., Windham & E. Wollenw. Maxon's goldback fern. Fern. Local, rare; deep shade, Ochoa Canyon north of Tom's Thumb, Marcus landslide. 854–1000 m. *BS6, MJ15.*

CONIFEROPHYTA

Cupressaceae

Juniperus arizonica R. P. Adams [*J. coahuilensis* (Martinez) Gaussen ex R. P. Adams]. Redberry juniper. Tree. Local, uncommon; scattered individuals in northern preserve. 848–851 m. *SJ1440.*

GNETOPHYTA

Ephedraceae

Ephedra aspera Engelm. ex S. Watson. [*Ephedra fasciculata* A. Nelson]. Arizona jointfir. Shrub. Widespread, occasional. 518–1118 m. *SJ1442, BP11.*

MAGNOLIOPHYTA—Magnoliopsida

Acanthaceae

Anisacanthus thurberi (Torr.) A. Gray. Thurber's desert honeysuckle. Shrub. Scarce, uncommon; northern preserve, in and along washes. 799–852 m. *BP34.*

Carlowrightia arizonica A. Gray. Arizona wrightwort. Perennial forb. Local, uncommon; rocky slopes in southern preserve, Brown's Mountain. 709–974 m. *CH13, LM3939.*

Justicia californica (Benth.) D. Gibson. Beloperone. Shrub. Local, common; rocky slopes, boulder exposures, also along washes. 504–943 m. *BP2, SJ1472.*

Justicia longii Hilsenb. [*Siphonoglossa longiflora* (Torr.) A. Gray] Siphonoglossa. Shrub. Scarce, rare; single small population. 842 m. *DG50.*

Amaranthaceae (includes Chenopodiaceae)

**Amaranthus albus* L. Prostrate pigweed. Ephemeral. Scarce, uncommon; cattle tanks. 738-789 m. *SJ1556.*

Amaranthus fimbriatus (Torr.) Benth. ex S. Watson. Fringed amaranth. Ephemeral. Local, uncommon; northern preserve. 736–1126 m. *SJ1559.*

Amaranthus torreyi (A. Gray) Benth. ex S. Watson. Torrey's amaranthus. Ephemeral. Scarce, uncommon; cattle tanks. 736–789 m. *SJ1557.*

Atriplex canescens (Pursh) Nutt. Fourwing saltbush. Shrub. Local, uncommon; re-vegetation area near residences on Ringtail Trail; Brown's Mountain. 529–851 m. *SJ1590.*

Atriplex elegans (Moq.) D. Dietr. var. *elegans.* Wheelscale saltbush. Ephemeral. Scarce, occasional; cattle tanks only. 736–789 m. *SJ1564.*

Chenopodium berlandieri Moq. Pitseed goosefoot. Ephemeral. Scarce, uncommon; cattle tank. 738 m. *SJ1635.*

Chenopodium pratericola Rydb. Desert goosefoot. Ephemeral. Scarce, uncommon; Black Hill Tank sediment northeast of Fraesfield Mountain. 785–789 m. *SJ1558.*

Chenopodium watsonii A. Nelson. Watson's goosefoot. Ephemeral. Scarce, rare; Frazier Spring and Lookout Point south of Tom's Thumb. 843–1150 m. *MJ31, SJ1800.*

Monolepis nuttalliana (J. A. Schultes) Greene. Nuttall's povertyweed. Ephemeral. Scarce, rare. 590–605 m. *CH42*(G), *SJ1740.*

**Salsola tragus* L. Prickly Russian thistle. Ephemeral. Scarce, rare; stock tank below Navajo power line. 736 m. *SJ1685.*

Tidestromia lanuginosa (Nutt.) Standl. Woolly tidestromia. Ephemeral. Scarce, uncommon; disturbed areas. 782–881 m. *SJ1555.*

Apiaceae

Bowlesia incana Ruiz & Pav. Hoary bowlesia. Ephemeral. Widespread, occasional; shady areas throughout preserve. 630–956 m. *SJ1394.*

Daucus pusillus Michx. American wild carrot. Ephemeral. Widespread, rare; disturbed wash areas, less common in upland areas. 586–845 m. *CH43*(G), *SJ1739.*

Lomatium nevadense (S. Watson) J. M. Coult. & Rose var. *nevadense.* Nevada biscuitroot. Perennial forb. Scarce, uncommon; restricted to diorite exposure south of Tom's Thumb. 1137–1149 m. *SJ1750.*

Apocynaceae (includes Ascelpiadaceae)

Asclepias nyctaginifolia A. Gray. Mojave milkweed. Perennial forb. Scarce, uncommon; restricted to washes. 785–837 m. *SJ1511.*

Cynanchum arizonicum (A. Gray) Shinners [*Metastelma arizonicum* A. Gray]. Arizona swallow-wort. Perennial vine. Scarce, rare; Lookout Point south of Tom's Thumb. 1155 m. *SJ s.n.* (photo).

Matelea parvifolia (Torr.) Woodson. Spearleaf. Perennial vine. Frequent, uncommon; uncommon but throughout preserve. 742–951 m. *SJ1430.*

Sarcostemma cynanchoides Decne. ssp. *hartwegii* (Vail) R. Holm. [*Funastrum cynanchoides* (Decne.) Schltr. ssp. *heterophyllum* (Engelm. & Torr.) Kartesz]. Climbing milkweed. Perennial vine. Frequent, occasional; usually along washes. 762–800 m. *MJ19.*

Aristolochiaceae

Aristolochia watsonii Wooton & Standl. Watson's dutchman's pipe. Perennial forb. Local, uncommon; granite boulders. 782–857 m. *SJ1625, SJ1656.*

Asclepiadaceae, see **Apocynaceae**

Asteraceae

Acamptopappus sphaerocephalus (Harv. & A. Gray ex A. Gray) A. Gray var. *sphaerocephalus.* Rayless goldenhead. Shrub. Local, occasional; common in burned area south of Fraesfield Mountain. 751 m. *SJ1529.*

Acourtia nana (A. Gray) Reveal & King. Dwarf desertpeony. Perennial forb. Local, rare; few locations, northern preserve. 832–844 m. *SJ1483.*

Acourtia wrightii (A. Gray) Reveal & King. Brownfoot. Perennial forb. Frequent, occasional. 748–1126 m. *DG52.*

Adenophyllum porophylloides (A. Gray) Strother. San Felipe dogweed. Perennial forb. Frequent, occasional. 664–1180 m. *SJ1391, LM3940.*

Ambrosia ambrosioides (Cav.) Payne. Canyon ragweed. Perennial forb. Widespread, occasional; washes and boulder piles. 504–974 m. *SJ1392, JP35.*

Ambrosia ambrosioides × *A. salsola* [*Ambrosia ambrosioides* x *Hymenoclea salsola*]. Shrub. Scarce, rare; single plant in large wash along Cholla power line. 728 m. *SJ1688, SJ1767.*

Ambrosia confertiflora DC. Slimleaf bursage. Perennial forb. Widespread, abundant; very common throughout preserve. 723–1153 m. *SJ1542.*

Ambrosia deltoidea (Torr.) Payne. Triangle-leaf bursage. Shrub. Widespread, abundant. 504–929 m. *BP8.*

Ambrosia dumosa (A. Gray) Payne. Burrobush. Shrub. Scarce, rare; re-vegetation area near residences. 519–529 m. *JM3.*

Ambrosia eriocentra (A. Gray) Payne. Hollyleaf bursage. Shrub. Scarce, uncommon; northern preserve, in washes only. 780–813 m. *SJ1492, MJ45.*

Ambrosia monogyra (Torr. & A. Gray) Strother & B. G. Baldwin [*Hymenoclea monogyra* Torr. & A. Gray]. Burrobrush. Shrub. Scarce, uncommon; northern end of Rawhide Wash. 769 m. *SJ1731.*

Ambrosia salsola (Torr. & A. Gray) Strother & B. G. Baldwin [*Hymenoclea salsola* Torr. & A. Gray]. Cheesebush. Shrub. Scarce, uncommon; northern preserve. 720–838 m. *SJ1639.*

Artemisia ludoviciana Nutt. ssp. *mexicana* (Willd. ex Spreng.) D. D. Keck. White sagebrush. Perennial forb. Local, occasional; moist, shady areas. 824–1135 m. *SJ1619, SJ1704.*

Baccharis brachyphylla A. Gray. Shortleaf baccharis. Shrub. Local, uncommon; along large washes. 725–818 m. *SJ1713.*

Baccharis salicifolia (Ruiz & Pav.) Pers. Water wally. Shrub. Scarce, rare; Troon outflow area. 747–782 m. *SJ1531, MJ43.*

Baccharis sarothroides A. Gray. Desertbroom. Shrub. Local, uncommon; Rawhide Wash and 2 plants in East End. 690–889 m. *SJ1523.*

Bahiopsis parishii (Greene) E. E. Schilling & Panero [*Viguiera parishii* Greene]. Parish goldeneye. Shrub. Widespread, common; widespread, occasionally dominant community member. 612–1170 m. *SJ1473.*

Baileya multiradiata Harv. & A. Gray ex A. Gray. Desert marigold. Perennial forb. Local, uncommon; usually in disturbed areas. 816–1180 m. *DG32.*

Bebbia juncea (Benth.) Greene var. *aspera* (Benth.) Greene. Sweetbush. Perennial forb. Local, occasional; large washes in southern preserve. 553–823 m. *SJ1538.*

Brickellia californica (Torr. & A. Gray) A. Gray. California brickellbush. Shrub. Scarce, rare; single population in shade of large boulder. 1122 m. *SJ1499.*

Brickellia coulteri A. Gray. Coulter's brickellbush. Shrub. Widespread, uncommon; slopes, washes and boulder piles. 553–974 m. *SJ1471.*

**Centaurea melitensis* L. Maltese star-thistle. Ephemeral. Scarce, rare; Dixie Mine. 684 m. *CH16.*

Chaenactis stevioides Hook. & Arn. Pincushion flower. Ephemeral. Scarce, rare; northern preserve. 849–866 m. *MJ49.*

Cirsium neomexicanum A. Gray. New Mexico thistle. Biennial forb. Frequent, uncommon; throughout preserve. 679–1170 m. *DG30, LM3931.*

Conyza canadensis (L.) Cronq. Canadian horseweed. Ephemeral. Scarce, rare; from soil sample collected at Frazier Spring. 786 m. *CH s.n.*(G).

Dieteria asteroides Torr. var. *glandulosa* (B. L. Turner) D. R. Morgan & R. L. Hartman [*Machaeranthera asteroides* (Torr.) Greene var. *glandulosa* B. L. Turner]. Fall tansyaster. Ephemeral. Scarce, rare; Brown's Mountain area. 799 m. *BP36.*

Encelia farinosa A. Gray ex Torr. var. *farinosa*. Brittlebush. Shrub. Widespread, occasional; most common in disturbed, especially burned, areas. 504–1147 m. *JM4.*

Encelia virginensis A. Nelson. Virgin River brittlebush. Shrub. Local, occasional; common south of Fraesfield Mountain. 751–855 m. *SJ1530.*

Ericameria laricifolia (A. Gray) Shinners [*Haplopappus laricifolius* Gray]. Turpentine bush. Shrub. Frequent, common; northern preserve. 612–1169 m. *SJ1595.*

Erigeron divergens Torr. & A. Gray. Spreading fleabane. Perennial forb. Local, occasional. 829–841 m. *SJ1429.*

Erigeron oreophilus Greenm. Chaparral fleabane. Perennial forb. Scarce, rare; north slope in East End. 982 m. *SJ1644.*

Eriophyllum lanosum (A. Gray) A. Gray [*Antheropeas lanosum* (A. Gray) Rydb.]. Woolly eriophyllum. Ephemeral. Frequent, occasional. 841 m. *SJ1426.*

Eriophyllum pringlei A. Gray. Pringle's woolly sunflower. Ephemeral. Frequent, occasional. 612–840 m. *SJ1428.*

Gnaphalium palustre Nutt. Western marsh cudweed. Ephemeral. Scarce, rare; stock tank below Cholla power line. 738 m. *SJ1633.*

Gutierrezia sarothrae (Pursh) Britton & Rusby. Broom snakeweed. Perennial forb. Widespread, occasional; throughout preserve. 700–1155 m. *SJ1804.*

Helianthus annuus L. Common sunflower. Ephemeral. Scarce, rare; Black Hill Tank sediments northeast of Fraesfield Mountain. 785 m. *SJ s.n.* (photo).

Heterotheca subaxillaris (Lam.) Britt. & Rusby. Camphorweed. Ephemeral. Scarce, rare; Tom's Thumb and Brown's Ranch trailheads, recently landscaped areas; otherwise absent from preserve. 829–845 m. *SJ1803.*

Isocoma acradenia (Greene) Greene var. *acradenia* [*Haplopappus acradenius* (Greene) S. F. Blake]. Alkali goldenbush. Perennial forb. Local, occasional; northern preserve. 739–818 m. *SJ1589.*

**Lactuca serriola* L. Prickly lettuce. Ephemeral. Scarce, rare; Black Hill Tank sediments northeast of Fraesfield Mountain. 788 m. *SJ1783.*

Lasthenia californica DC. ex Lindl. California goldfields. Ephemeral. Frequent, occasional; abundant in some areas in northern preserve. 785–857 m. *DG28.*

Layia glandulosa (Hook.) Hook. & Arn. Whitedaisy tidytips. Ephemeral. Scarce, rare; remarkably sparse member of spring flora. 1002 m. *SJ1753.*

Logfia arizonica (A. Gray) Holub [*Filago arizonica* A. Gray]. Arizona cottonrose. Ephemeral. Local, common; northern preserve. 584–729 m. *SJ1738, SJ1757.*

Logfia filaginoides (Hook. & Arn.) Morefield [*Logfia californica* (Nutt.) Holub]. California cottonrose. Ephemeral. Local, uncommon. 729 m. *SJ1640.*

Melampodium leucanthum Torr. & A. Gray. Plains blackfoot. Perennial forb. Local, occasional. 834–1132 m. *SJ1420, MJ35.*

Monoptilon bellioides (A. Gray) H. M. Hall. Mojave desertstar. Ephemeral. Scarce, uncommon; seen in northern preserve and Dixie Mine area. 817–849 m. *SJ1746.*

**Oncosiphon piluliferum* (L. f.) Källersjö. Stinknet. Ephemeral. Recent introduction. Local, uncommon. 752–779 m. *SJ1525.*

Pectis papposa Harv. & A. Gray var. *papposa*. Chinchweed. Ephemeral. Local, occasional; Tom's Thumb trail. 1057–1126 m. *SJ1675.*

Perityle emoryi Torr. Emory's rockdaisy. Ephemeral. Scarce, rare; wash below Taliesin overlook. 587–612 m. *CH26.*

Pluchea sericea (Nutt.) Coville. Arrowweed. Shrub. Scarce, uncommon; Dixie Mine and stock tank below Cholla power line. 690–736 m. *SJ1637.*

Porophyllum gracile Benth. Slender poreleaf. Perennial forb. Widespread, occasional. 504–919 m. *SJ1407.*

Pseudognaphalium canescens (DC.) W. A. Weber [*Gnaphalium wrightii* A. Gray]. Wright's cudweed. Shrub. Scarce, rare; granitic slopes. 1122–1135 m. *CH56*(G), *SJ1682.*

Psilostrophe cooperi (A. Gray) Greene. Whitestem paperflower. Shrub. Local, uncommon; northern preserve. 805–844 m. *SJ1534.*

Rafinesquia californica Nutt. California chicory. Ephemeral. Scarce, rare; diorite exposure south of Tom's Thumb. 1169 m. *JM17.*

Rafinesquia neomexicana A. Gray. New Mexico plumeseed. Ephemeral. Local, occasional; throughout preserve. 619–914 m. *DG19.*

Senecio flaccidus Less. var. *monoensis* (Greene) B. L. Turner & T. M. Barkley. Sand wash groundsel. Shrub. Local, occasional; shady slopes. 785–837 m. *SJ1416.*

Senecio lemmonii A. Gray. Lemmon's ragwort. Perennial forb. Local, occasional. 679–1058 m. *SJ1393.*

**Sonchus oleraceus* L. Common sowthistle. Ephemeral. Scarce, rare; Dixie Mine, Tom's Thumb trail; greenhouse. 684–894 m. *CH17, CH40*(G), *DG73.*

Stephanomeria pauciflora (Torr.) A. Nelson. Brownplume wirelettuce. Shrub. Widespread, common. 612–1153 m. *SJ1456.*

Stylocline gnaphaloides Nutt. Everlasting desertstraw. Ephemeral. Local, occasional. 584–857 m. *SJ1758.*

Stylocline micropoides A. Gray. Woollyhead neststraw. Ephemeral. Widespread, occasional. 819–851 m. *SJ1418, MJ13.*

Trixis californica Kellogg. American threefold. Shrub. Widespread, occasional. 504–854 m. *DG35.*

Uropappus lindleyi (DC.) Nutt. [*Microseris lindleyi* (DC.) A. Gray]. Silver puffs. Ephemeral. Frequent, occasional. 619–720 m. *DG16.*

Xanthisma gracile (Nutt.) D. R. Morgan & R. L. Hartman [*Machaeranthera gracilis* (Nutt.) Shinners]. Slender goldenweed. Ephemeral. Local, uncommon. 930–1133 m. *SJ1576.*

Xanthisma spinulosum (Pursh) D. R. Morgan & R. L. Hartman var. *gooddingii* (A. Nelson) D. R. Morgan & R. L. Hartman [*Machaeranthera pinnatifida* (Hook.) Shinners ssp. *gooddingii* (A. Nelson) B. L. Turner var. *gooddingii*]. Goodding's tansyaster. Perennial forb. Local, occasional. 641–1151 m. *DG27, SJ1501.*

Xanthium strumarium L. Rough cocklebur. Ephemeral. Scarce, occasional; Black Hill Tank sediments northeast of Fraesfield Mountain. 785 m. *SJ1598.*

Berberidaceae

Berberis haematocarpa Woot. [*Mahonia haematocarpa* (Woot.) Fedde]. Bloodberry barberry. Shrub. Scarce, rare; northeast corner of preserve. 822–876 m. *SJ1744.*

Boraginaceae (includes Hydrophyllaceae)

Amsinckia menziesii (Lehm.) A. Nelson & J. F. Macbr. var. *intermedia* (Fisch. & C. A. Mey.) Ganders. Common fiddleneck. Ephemeral. Widespread, common. 504–998 m. *SJ1384.*

Amsinckia tessellata A. Gray. Bristly fiddleneck. Ephemeral. Widespread, uncommon. 888–1096 m. *SJ1474.*

Cryptantha barbigera (A. Gray) Greene. Bearded cryptantha. Ephemeral. Widespread, common. 512–940 m. *SJ1475, MJ18.*

Cryptantha decipiens (M. E. Jones) A. Heller. Gravelbar cryptantha. Ephemeral. Widespread, common. 512–956 m. *SJ1354, SJ1355.*

Cryptantha muricata (Hook. & Arn.) A. Nelson & J. F. Macbr. Pointed cryptantha. Ephemeral. Local, uncommon. 739–943 m. *SJ1463.*

Cryptantha pterocarya (Torr.) Greene var. *cycloptera* (Greene) J. F. Macbr. Wingnut cryptantha. Ephemeral. Frequent, occasional. 527–888 m. *SJ1477.*

Cryptantha pterocarya (Torr.) Greene var. *pterocarya*. Wingnut cryptantha. Ephemeral. Local, uncommon; Ochoa Canyon north of Tom's Thumb. 604–1020 m. *SJ1401*.

Emmenanthe penduliflora Benth. Whisperingbells. Ephemeral. Local, rare. 514–619 m. *DG72*.

Eucrypta chrysanthemifolia (Benth.) Greene. Spotted hideseed. Ephemeral. Frequent, occasional; shady slopes, wash edges. 527–956 m. *SJ1383*.

Harpagonella palmeri A. Gray var. *arizonica* I. M. Johnston. Arizona grapplinghook. Ephemeral. Local, occasional; southern preserve. 605–860 m. *SJ1433*.

Pectocarya heterocarpa (I. M. Johnst.) I. M. Johnst. Chuckwalla combseed. Ephemeral. Widespread, occasional. 770 m. *MJ21*.

Pectocarya platycarpa (Munz & I. M. Johnst.) Munz & I. M. Johnst. Broadfruit combseed. Ephemeral. Widespread, occasional. 726–1169 m. *SJ1400*.

Pectocarya recurvata I. M. Johnst. Curvenut combseed. Ephemeral. Widespread, abundant. 526–1169 m. *SJ1389*.

Pectocarya setosa A. Gray. Moth combseed. Ephemeral. Scarce, rare; Ochoa Canyon north of Tom's Thumb. 928 m. *SJ1396*.

Phacelia affinis A. Gray. Limestone phacelia. Ephemeral. Scarce, rare. 748 m. *SJ1760*.

Phacelia crenulata Torr. ex S. Watson var. *ambigua* (M.E. Jones) J. F. Macbr. Purplestem phacelia. Ephemeral. Scarce, uncommon; basaltic dike in northern preserve, diorite exposure south of Tom's Thumb. 848–1180 m. *SJ1627, SJ1747*.

Phacelia cryptantha Greene. Hiddenflower phacelia. Ephemeral. Frequent, uncommon. 604–824 m. *BP19*.

Phacelia distans Benth. Distant phacelia. Ephemeral. Widespread, common. Two variants: one widespread, common, smaller, early–flowering, leaf lobes narrow to wide; second along Rawhide Wash, larger, later–flowering, large, finely–divided leaves. 573–1012 m. *SJ1461, BP16*.

Phacelia ramosissima Dougl. ex Lehm. Branching phacelia. Ephemeral. Local, uncommon. 729–824 m. *SJ1408*.

Pholistoma auritum (Lindl.) Lilja var. *arizonicum* (M. E. Jones) Constance. Arizona fiestaflower. Ephemeral. Widespread, occasional; shady, rocky slopes, washes. 584–1020 m. *SJ1382*.

Plagiobothrys arizonicus (A. Gray) Greene ex A. Gray. Arizona popcornflower. Ephemeral. Widespread, occasional. 728–928 m. *SJ1397*.

Plagiobothrys pringlei Greene. Pringle's popcornflower. Ephemeral. Scarce, rare; east of Brown's Mountain. Associated with *Pogonomyrmex* ant nests. 728–824 m. *SJ1397*.

Brassicaceae

Boechera perennans (S. Watson) W. A. Weber [*Arabis perennans* S. Watson]. Perennial rockcress. Perennial forb. Frequent, occasional; rocky slopes. 848–1155 m. *SJ1369*.

**Brassica tournefortii* Gouan. Asian mustard. Ephemeral. Local, occasional; Sunrise and Lookout Trails. 753–1180 m. *DG11*.

Caulanthus lasiophyllus (Hook. & Arn.) Payson [*Guillenia lasiophylla* (Hook. & Arn.) Greene]. California mustard. Ephemeral. Frequent, occasional. 584–824 m. *SJ1452, DG18*.

Descurainia pinnata (Walter) Britton ssp. *ochroleuca* (Wooton) Detling. Western tansymustard. Ephemeral. Local, uncommon; seen in northern preserve, too. Sepals distinctly purple. 586 m. *SJ1736*.

Draba cuneifolia Nutt. ex Torr. & A. Gray var. *integrifolia* S. Watson. Wedgeleaf draba. Ephemeral. Local, uncommon; greenhouse; less widespread than expected. 586–748 m. *SJ1761*.

Lepidium lasiocarpum Nutt. Shaggyfruit pepperweed. Ephemeral. Local, uncommon. 587–1169 m. *CH41*(G), *SJ1622*.

Physaria tenella (A. Nelson) O'Kane & Al–Shehbaz [*Lesquerella tenella* A. Nelson]. Moapa bladderpod. Ephemeral. Local, occasional. 601–748 m. *SJ1378*.

**Sisymbrium irio* L. London rocket. Ephemeral. Scarce, rare; Dixie Mine. 684–821 m. *CH18*.

Thysanocarpus curvipes Hook. Sand fringepod. Ephemeral. Frequent, occasional. 604–1137 m. *DG8*.

Cactaceae

Carnegiea gigantea (Engelm.) Britton & Rose. Saguaro. Succulent. Widespread, common. 504–1169 m. *WH26938*.

Cylindropuntia acanthocarpa (Engelm. & J. M. Bigelow) F. M. Knuth var. *coloradensis* L. D. Benson) D. J. Pinkava. Buckhorn cholla. Succulent. Widespread, common. 516–1180 m. *WH26932.*

Cylindropuntia acanthocarpa (Engelm. & J. M. Bigelow) F. M. Knuth var. *major* (Engelm.) Pinkava. Buckhorn cholla. Succulent. Local, occasional; present on diorite exposure south of Tom's Thumb. 1140 m. *SJ s.n.* (photo).

Cylindropuntia arbuscula (Engelm.) F. M. Knuth. Arizona pencil cholla. Succulent. Scarce, rare; single plant. 840 m. *WH26931.*

Cylindropuntia bigelovii (Engelm.) F. M. Knuth var. *bigelovii.* Teddybear cholla. Succulent. Widespread, occasional. 519–1155 m. *WH26933.*

Cylindropuntia fulgida (Engelm.) F. M. Knuth var. *fulgida.* Chain-fruit cholla. Succulent. Widespread, occasional. 519–930 m. *SJ1659.*

Cylindropuntia leptocaulis (DC.) F. M. Knuth. Christmas cholla. Succulent. Widespread, occasional. 758–977 m. *WH26937.*

Cylindropuntia ×tetracantha (Toumey) F. M. Knuth. Tucson pricklypear [*sic*]. Succulent. Scarce, rare; single plant, hybrid between *C. acanthocarpa* and *C. leptocaulis.* 812 m. *SJ1772.*

Echinocereus engelmannii (Parry ex Engelm.) Lem. Engelmann's hedgehog cactus. Succulent. Widespread, common. 520–1170 m. *WH26743.*

Ferocactus cylindraceus (Engelm.) Orcutt. California barrel cactus. Succulent. Widespread, common; aberrant growth on one specimen (*Hodgson 26940*, DES). 518–1179 m. *WH26940, WH27229.*

Mammillaria grahamii Engelm. Graham's nipple cactus. Succulent. Local, occasional. 521–940 m. *SJ1661.*

Opuntia chlorotica Engelm. & J. M. Bigelow. Dollarjoint pricklypear. Succulent. Local, uncommon; Brown's Mountain area, East End. 818–943 m. *WH26934, WH27228.*

Opuntia engelmannii Salm-Dyck ex Engelm. var. *engelmannii.* Cactus apple. Succulent. Widespread, common. 520–1179 m. *LM3932, LM3933, LM3934.*

Opuntia engelmannii Salm-Dyck ex Engelm. var. *linguiformis* (Griffiths) Parfitt & Pinkava. Cow's tongue pricklypear. Succulent. Scarce, rare, native to Chihuahuan desert; likely established from discarded landscape debris. 803 m. *SJ s.n.* (photo).

Opuntia phaeacantha Engelm. Tulip pricklypear. Succulent. Frequent, common; northern preserve. 820–1180 m. *LM3935, LM3936.*

Opuntia ×curvospina Griffiths (pro sp.). Searchlight pricklypear. Succulent. Scarce, rare. 820–840 m. *WH26930, WH26936.*

Peniocereus greggii (Engelm.) Britton & Rose var. *transmontanus* (Engelm.) Backeberg. Nightblooming cereus. Succulent. Local, uncommon; northern preserve; East End. 956–1096 m. *LM3931.*

Cannabaceae

Celtis pallida Torr. [*Celtis ehrenbergiana* (Klotzsch) Liebm.]. Spiny hackberry. Shrub. Widespread, occasional. 578–1100 m. *SJ1363.*

Celtis reticulata Torr. [*Celtis laevigata* Willd. var. *reticulata* (Torr.) L. D. Benson]. Netleaf hackberry. Tree. Scarce, uncommon; Ochoa Canyon north of Tom's Thumb; East End. 956–1100 m. *SJ1404.*

Caryophyllaceae

**Herniaria hirsuta* L. ssp. *cinerea* (DC.) Coutinho. Hairy rupturewort. Ephemeral. Local, uncommon; cattle tanks, disturbed areas. 738–854 m. *SJ1521.*

Loeflingia squarrosa Nutt. Spreading pygmyleaf. Ephemeral. Scarce, rare. 717–728 m. *SJ1764.*

Minuartia douglasii (Fenzl ex Torr. & A. Gray) Mattf. Douglas' stitchwort. Ephemeral. Local, occasional; northern preserve. 612–1036 m. *SJ1651.*

Silene antirrhina L. Sleepy silene. Ephemeral. Local, uncommon. 584–836 m. *CH44*(G), *SJ1737.*

Celastraceae

Canotia holacantha Torr. Crucifixion thorn. Tree. Local, common; northern preserve and diorite exposure south of Tom's Thumb. 799–1149 m. *SJ1441.*

Chenopodiaceae, see **Amaranthaceae**

Cleomaceae

Polanisia dodecandra (L.) DC. ssp. *trachysperma* (Torr. & A. Gray) Iltis. Sandyseed clammyweed. Ephemeral. Scarce, rare. 723–765 m. *SJ1712.*

Convolvulaceae

Evolvulus arizonicus A. Gray. Wild dwarf morning-glory. Ephemeral. Scarce, rare; Lookout Point south of Tom's Thumb. 1155 m. *SJ1729.*

Cuscuta indecora Choisy. Bigseed alfalfa dodder. Perennial parasitic vine. Local, rare. Hosts: *Acacia greggii* and *Ericameria laricifolia.* 825–978 m. *SJ1455.*

Cuscuta umbellata Kunth. Flatglobe dodder. Ephemeral parasitic vine. Local, uncommon; Tom's Thumb trail. Host: *Boerhavia intermedia.* 1057 m. *SJ1678.*

Ipomoea cristulata Hallier f. Trans-pecos morning-glory. Ephemeral vine. Local, uncommon. 801–1057 m. *SJ1677.*

**Ipomoea hederacea* Jacq. Ivyleaf morning-glory. Ephemeral vine. Scarce, uncommon. 801 m. *SJ1693.*

Crassulaceae

Crassula connata (Ruiz & Pav.) A. Berger. Sand pygmyweed. Ephemeral. Scarce, rare. 748–774 m. *CH32.*

Dudleya saxosa (M. E. Jones) Britt. & Rose ssp. *collomiae* (Rose ex Morton) Moran [*Dudleya collomiae* Rose ex Morton]. Gila County liveforever. Perennial forb. Scarce, rare; Lookout Point and lower along Tom's Thumb trail to west. 1155 m. *SJ s.n.* (photo).

Crossosomataceae

Crossosoma bigelovii S. Watson. Ragged rockflower. Shrub. Local, occasional; rocky, shady slopes. 695–1155 m. *DG3.*

Cucurbitaceae

Cucurbita digitata A. Gray. Fingerleaf gourd. Perennial vine. Scarce, uncommon; sizeable population in northeastern preserve. 743–817 m. *SJ1717.*

Marah gilensis Greene. Gila manroot. Perennial vine. Frequent, occasional; washes and slopes. 726–1096 m. *SJ1455.*

Cuscutaceae, see **Convolvulaceae**

Euphorbiaceae

Ditaxis lanceolata (Benth.) Pax & K. Hoffmann [*Argythamnia lanceolata* (Benth.) Müll. Arg.]. Narrowleaf silverbush. Perennial forb. Local, occasional. 641–812 m. *SJ1460, DG47.*

Ditaxis neomexicana (Müll. Arg.) A. Heller [*Argythamnia neomexicana* Müll. Arg.]. New Mexico silverbush. Ephemeral. Local, uncommon. 822–1180 m. *SJ1569.*

Euphorbia abramsiana L. C. Wheeler [*Chamaesyce abramsiana* (L. C. Wheeler) Koutnik]. Abrams' sandmat. Ephemeral. Local, uncommon. 736–785 m. *SJ1657, SJ1698.*

Euphorbia arizonica Engelm. [*Chamaesyce arizonica* (Engelm.) Arthur]. Arizona sandmat. Perennial forb. Local, uncommon. 717–1169 m. *MJ38.*

Euphorbia capitellata Engelm. [*Chamaesyce capitellata* (Engelm.) Millsp.]. Head sandmat. Perennial forb. Frequent, occasional. 758–855 m. *BS10, BP33.*

Euphorbia eriantha Benth. Beetle spurge. Ephemeral. Local, uncommon. 717–1169 m. *DG40.*

Euphorbia florida Engelm. [*Chamaesyce florida* (Engelm.) Millsp.]. Chiricahua Mountain sandmat. Ephemeral. Local, uncommon. 782–1139 m. *SJ1663, SJ1691.*

Euphorbia melanadenia Torr. [*Chamaesyce melanadenia* (Torr.) Millsp.]. Red-gland spurge. Perennial forb. Frequent, occasional. 774–888 m. *CH1, MJ42.*

Euphorbia micromera Boiss. ex Engelm. [*Chamaesyce micromera* (Boiss. ex Engelm.) Woot. & Standl.]. Sonoran sandmat. Ephemeral. Frequent, occasional. 836–847 m. *SJ1565.*

Euphorbia pediculifera Engelm. [*Chamaesyce pediculifera* (Engelm.) Rose & Standl.]. Carrizo Mountain sandmat. Perennial forb. Local, uncommon. 612–866 m. *SJ1669.*

Euphorbia polycarpa Benth. [*Chamaesyce polycarpa* (Benth.) Millsp. ex Parish]. Smallseed sandmat. Perennial forb. Widespread, abundant. 717–1126 m. *SJ1487, DG31.*

Euphorbia revoluta Engelm. [*Chamaesyce revoluta* (Engelm.) Small]. Threadstem sandmat. Ephemeral. Scarce, rare. 960 m. *SJ1680.*

Euphorbia setiloba Engelm. ex Torr. [*Chamaesyce setiloba* (Engelm. ex Torr.) Millsp. ex Parish]. Yuma sandmat. Ephemeral. Local, uncommon. 765–769 m. *SJ1566.*

Tragia nepetifolia Cav. Catnip noseburn. Perennial forb. Local, occasional; usually along washes. 817–821 m. *SJ1537.*

Tragia ramosa Torr. Branched noseburn. Perennial forb. Local, occasional; usually along washes. 785–852 m. *SJ1571.*

Fabaceae

Acacia constricta Benth. Whitethorn acacia. Tree. Local, occasional; northeastern preserve; single plant on Ringtail Trail in revegetated area. 529–860 m. *SJ1539.*

Acacia greggii A. Gray. Catclaw acacia. Tree. Widespread, abundant. 534–1179 m. *CH12.*

Astragalus nuttallianus DC. Smallflowered milkvetch. Ephemeral. Local, uncommon; Lost Dog and 128th Street locations. 791 m. *SJ1766.*

Calliandra eriophylla Benth. Fairyduster. Perennial forb. Frequent, common. 612–1180 m. *SJ1370.*

Lotus humistratus Greene. Foothill deervetch. Ephemeral. Widespread, occasional. 597–860 m. *SJ1491, MJ20.*

Lotus rigidus (Benth.) Greene. Shrubby deervetch. Shrub. Frequent, common. 789–1155 m. *DG29.*

Lotus salsuginosus Greene var. *brevivexillus* Ottley. Coastal bird's-foot trefoil. Ephemeral. Local, uncommon; washes. 587–817 m. *CH27.*

Lotus strigosus (Nutt.) Greene var. *tomentellus* (Greene) Isely. Strigose bird's-foot trefoil. Ephemeral. Local, occasional. 717–824 m. *SJ1743.*

Lupinus concinnus J. G. Agardh. Bajada lupine. Ephemeral. Frequent, occasional; washes. 726–857 m. *SJ1427.*

Lupinus sparsiflorus Benth. Desert lupine. Ephemeral. Widespread, occasional. 586–1169 m. *DG10.*

Marina parryi (Torr. & A. Gray) Barneby. Parry's false prairie-clover. Perennial forb. Local, occasional. 771–943 m. *SJ1462.*

Mimosa aculeaticarpa Ortega var. *biuncifera* (Benth.) Barneby. Catclaw mimosa. Shrub. Scarce, rare; several along power line road. 844–855 m. *SJ1541.*

Olneya tesota A. Gray. Desert ironwood. Tree. Frequent, occasional. 504–843 m. *SJ1368.*

Parkinsonia florida (Benth. ex A. Gray) S. Watson [*Cercidium floridum* Benth. ex A. Gray]. Blue paloverde. Tree. Widespread, occasional; riparian at low elevations; small upland specimens at higher semidesert grassland locations. 720–1180 m. *SJ1480.*

Parkinsonia microphylla Torr. [*Cercidium microphyllum* (Torr.) Rose & I. M. Johnst.]. Foothill paloverde. Tree. Widespread, abundant. 504–1179 m. *BP37.*

Prosopis juliflora (Sw.) DC. var. *velutina* (Woot.) Sarg. [*Prosopis velutina* Woot.]. Velvet mesquite. Tree. Frequent, occasional. 684–1153 m. *DG42.*

**Senna artemisioides* (Gaud. ex DC.) Randell. Silver senna. Shrub. Scarce, rare; few individuals; East End trail and near Tom's Thumb. 812–1140 m. *SJ1457.*

Senna covesii (A. Gray) Irwin & Barneby [*Cassia covesii* A. Gray]. Rattlebox senna. Ephemeral. Frequent, occasional. 527–1179 m. *JP25.*

Vicia ludoviciana Nutt. ssp. *ludoviciana.* Louisiana vetch. Ephemeral. Local, uncommon; wash edges, northern preserve. 824–951 m. *SJ1443.*

Fagaceae

Quercus turbinella Greene. Sonoran scrub oak. Shrub. Local, occasional; usually along washes in northern preserve; also diorite exposure south of Tom's Thumb. 801–1081 m. *SJ1446.*

Fouquieriaceae

Fouquieria splendens Engelm. Ocotillo. Tree. Widespread, occasional. 518–1169 m. *JP36.*

Geraniaceae

**Erodium cicutarium* (L.) L'Her. ex Aiton. Redstem stork's bill. Ephemeral. Widespread, abundant. 553–1180 m. *SJ1417, JM5.*

Erodium texanum A. Gray. Texas stork's bill. Ephemeral. Scarce, rare. 748–1180 m. *SJ1748.*

Hydrophyllaceae, see **Boraginaceae**

Krameriaceae

Krameria bicolor S. Watson [*Krameria grayi* Rose & Painter]. White ratany. Shrub. Widespread, common. 523–977 m. *SJ1514, BP25.*

Krameria erecta Willd. ex Schult. [*Krameria parvifolia* Benth.]. Littleleaf ratany. Shrub. Frequent, occasional. 612–1115 m. *SJ1493.*

Lamiaceae

Hedeoma nana Greene ssp. *nana.* Mock-pennyroyal. Perennial forb. Local, rare. 720–920 m. *CH14.*

Hyptis emoryi Torr. Desert lavender. Shrub. Frequent, occasional; slopes, rocky exposures. 609–929 m. *SJ1395, LM3938.*

Salazaria mexicana Torr. Mexican bladdersage. Shrub. Local, occasional; northern area. 811–838 m. *CH22.*

Salvia columbariae Benth. Chia. Ephemeral. Frequent, occasional. 553–1134 m. *MJ33.*

Loasaceae

Mentzelia affinis Greene. Yellowcomet. Ephemeral. Local, uncommon; washes; southern preserve. 589–1619 m. *SJ1387, CH29.*

Mentzelia albicaulis (Hook.) Dougl. ex Torr. & A. Gray. Whitestem blazingstar. Ephemeral. Scarce, occasional; southern preserve. 587–592 m. *SJ1742.*

Mentzelia multiflora (Nutt.) A. Gray. Adonis blazingstar. Perennial forb. Local, uncommon; washes and roadsides. 786 m. *MJ47.*

Malpighiaceae

Cottsia gracilis (A. Gray) W. R. Anderson [*Janusia gracilis* A. Gray]. Slender janusia. Perennial vine. Widespread, occasional. 654–1180 m. *BP22, JB2.*

Malvaceae

Abutilon incanum (Link) Sweet. Pelotazo. Shrub. Local, uncommon. 694–974 m. *SJ1626.*

Abutilon palmeri A. Gray. Palmer's Indian mallow. Shrub. Local, uncommon; boulder piles on pediment. 754–855 m. *SJ1629.*

Abutilon parvulum A. Gray. Dwarf Indian mallow. Perennial forb. Local, uncommon; wash edges in northern preserve. 782–837 m. *SJ1536.*

Ayenia filiformis S. Watson. Trans-Pecos ayenia. Perennial forb. Local, occasional; occasional on rocky granite slopes in the East End; common on Cholla and Granite Mountains; dense patch of several acres on the northwest bajada of Granite Mountain (33.7888 –111.8096). 921–951 m. *SJ1470.*

Herissantia crispa (L.) Briz. Bladdermallow. Perennial forb. Local, common; rocky granite slopes and boulder piles. 754–1135 m. *SJ1467, MJ36.*

Hibiscus coulteri Harvey ex A. Gray. Desert rosemallow. Shrub. Scarce, rare; north–facing slope on Windgate Pass Trail. 835–1155 m. *SJ1439.*

**Malva parviflora* L. Cheeseweed mallow. Ephemeral. Scarce, rare; Black Hill Tank sediments northeast of Fraesfield Mountain. 786–789 m. *SJ1623.*

**Sida abutifolia* Mill. Spreading fanpetals. Perennial forb. Scarce, rare; Lookout Point south of Tom's Thumb. 1115–1122 m. *SJ1801.*

Sphaeralcea ambigua A. Gray ssp. *ambigua.* Apricot globemallow. Perennial forb. Widespread, common; abundant in some locations, especially where fire had occurred. 553–1179 m. *MJ23.*

Sphaeralcea rusbyi A. Gray. Rusby's globemallow. Perennial forb. Local, uncommon; upper elevations and north–facing slopes. 894–1096 m. *SJ1434.*

Martyniaceae

Proboscidea althaeifolia (Benth.) Decne. Desert unicorn-plant. Perennial forb. Local, uncommon. 823–825 m. *SJ1552, SJ1787.*

Proboscidea parviflora (Woot.) Woot. & Standl. Doubleclaw. Ephemeral. Scarce, common; Black Hill Tank sediments northeast of Fraesfield Mountain. 785–789 m. *SJ1553.*

Montiaceae

Calandrinia ciliata (Ruiz & Pav.) DC. Fringed redmaids. Ephemeral. Local, occasional. 630–1137 m. *DG13.*

Cistanthe monandra (Nutt.) Hershkovitz. Common pussypaws. Ephemeral. Scarce, rare; northeast corner. 824 m. *SJ1745.*

Claytonia perfoliata Donn. ex Willd. ssp. *mexicana* (Rydb.) J. M. Miller & K. Chambers. Miner's lettuce. Ephemeral. Local, uncommon; shady moist areas. 695–998 m. *BS5.*

Nyctaginaceae

Allionia choisyi Standl. Annual windmills. Ephemeral. Scarce, rare; northern preserve, two locations, new Maricopa County record. 785–837 m. *SJ1696.*

Allionia incarnata L. var. *villosa* (Standl.) B. L. Turner. Trailing windmills. Perennial forb. Local, occasional; upper elevations, Bell Pass south of McDowell Peak and Tom's Thumb. 740–1180 m. *BP31.*

Boerhavia coccinea Mill. Scarlet spiderling. Ephemeral. Local, occasional; northern preserve. 785–836 m. *SJ1560.*

Boerhavia coulteri (Hook. f.) S. Watson. Coulter's spiderling. Ephemeral. Scarce, uncommon. 785–791 m. *SJ1689.*

Boerhavia intermedia M. E. Jones. Fivewing spiderling. Ephemeral. Local, occasional; northern preserve. 779–1155 m. *SJ1567.*

Boerhavia spicata Choisy. Creeping spiderling. Ephemeral. Scarce, uncommon. 785–791 m. *SJ1694.*

Boerhavia wrightii A. Gray. Largebract spiderling. Ephemeral. Local, occasional; northern preserve. 930 m. *SJ1578.*

Commicarpus scandens (L.) Standl. [*Boerhavia scandens* L.]. Climbing wartclub. Perennial vine. Scarce, uncommon; single community. 841 m. *SJ1568.*

Mirabilis coccinea (Torr.) Benth. & Hook. f. Scarlet four o'clock. Perennial forb. Local, occasional; Tom's Thumb and East End, upper elevations and north-facing slopes. 1096 m. *MJ32.*

Mirabilis laevis (Benth.) Curran var. *villosa* (Kellogg) Spellenb. Wishbone-bush. Perennial forb. Widespread, occasional. 600–1170 m. *CH11, JP33.*

Mirabilis multiflora (Torr.) A. Gray var. *multiflora.* Colorado four o'clock. Perennial forb. Local, uncommon; Tom's Thumb, upper elevations and north-facing slopes, northern preserve. 770–1096 m. *JP51.*

Oleaceae

Menodora scabra A. Gray. Rough menodora. Shrub. Local, occasional; northern preserve, north-facing slopes. 762–849 m. *DG25.*

Onagraceae

Camissonia californica (Nutt. ex Torr. & A. Gray) Raven. California suncup. Ephemeral. Local, occasional. 586–1169 m. *DG23.*

Camissonia confusa Raven. San Bernardino suncup. Ephemeral. Local, occasional; washes and low areas in the northern preserve. 720–852 m. *SJ1756, SJ1781.*

Camissonia micrantha (Hornem. ex Spreng.) Raven. Miniature suncup. Ephemeral. Local, uncommon; washes. 800 m. *SJ1453.*

Camissonia pallida (Abrams) Raven. Paleyellow suncup. Ephemeral. Frequent, uncommon; washes. 888 m. *JP43.*

Clarkia epilobioides (Nutt. ex Torr. & A. Gray) A. Nelson & J. F. Macbr. Canyon clarkia. Ephemeral. Local, uncommon; deep shade of boulders, Tom's Thumb and East End. 953–956 m. *MJ12, BS1.*

Oenothera elata Kunth ssp. *hirsutissima* (A. Gray ex S. Watson) W. Dietr. Hooker's evening primrose. Perennial forb. Scarce, rare; state land parcel, below Thompson Peak. 1145 m. *MT s.n.* (photo).

Oenothera primiveris A. Gray ssp. *primiveris*. Large yellow desert primrose. Ephemeral. Scarce, rare; southeast slope Brown's Mountain. 865 m. *MT s.n.* (photo).

Orobanchaceae

Castilleja applegatei Fern. ssp. *martinii* (Abrams) Chuang & Heckard. Wavyleaf Indian paintbrush. Perennial forb. Scarce, rare; relict grassland community on northeast–facing slope of Brown's Mountain. 868 m. *SJ1445*.

Castilleja exserta (Heller) Chuang & Heckard ssp. *exserta*. Exserted Indian paintbrush. Ephemeral. Scarce, rare. 791–833 m. *DG67*.

Orobanche cooperi (A. Gray) Heller. Desert broomrape. Ephemeral parasitic forb. Scarce, rare. 773 m. *MJ28*.

Papaveraceae

Argemone pleiacantha Greene. Southwestern pricklypoppy. Ephemeral. Local, uncommon; disturbed areas. 786–844 m. *SJ1422*.

Eschscholzia californica Cham. ssp. *mexicana* (Greene) C. Clark. California poppy. Ephemeral. Widespread, occasional. 587–1180 m. *JP52*, *SJ1741*.

Phyrmaceae

Mimulus guttatus DC. Seep monkeyflower. Ephemeral. Scarce, rare; Frazier Spring on Tom's Thumb Trail. 767 m. *MJ30*.

Plantaginaceae

Keckiella antirrhinoides (Benth.) Straw. Snapdragon penstemon. Shrub. Local, common; rocky, granitic slopes. 790–1132 m. *MJ6*, *LM3937*.

Maurandella antirrhiniflora (Humb. & Bonpl. ex Willd.) Rothm. Snapdragon vine. Perennial vine. Scarce, rare; relict grassland community on northeast–facing slope of Brown's Mountain. 865 m. *SJ1444*.

Penstemon pseudospectabilis M. E. Jones ssp. *connatifolius* (A. Nelson) D. D. Keck. Desert beardtongue. Perennial forb. Scarce, rare; Tom's Thumb area. 1028 m. *JP46*.

Penstemon subulatus M. E. Jones. Hackberry beardtongue. Perennial forb. Local, uncommon; northern preserve. 816–1169 m. *CH8*.

Plantago ovata Forssk. Desert Indianwheat. Ephemeral. Widespread, occasional. 584–940 m. *SJ1380*.

Plantago patagonica Jacq. Woolly plantain. Ephemeral. Widespread, uncommon. 597–1135 m. *SJ1339*.

Sairocarpus nuttallianus (Benth. ex A. DC.) D. A. Sutton. Violet snapdragon. Ephemeral. Scarce, rare; TT/Glass Dome trail junction. 1134 m. *MJ s.n.* (photo).

Veronica peregrina L. Neckweed. Ephemeral. Local, uncommon; cattle tanks. 738 m. *SJ1631*.

Polemoniaceae

Eriastrum diffusum (A. Gray) H. Mason. Miniature woollystar. Ephemeral. Widespread, uncommon. 612–866 m. *SJ1423*.

Eriastrum eremicum (Jeps.) H. Mason. Desert woollystar. Ephemeral. Frequent, abundant. 586–1170 m. *BP26*.

Gilia flavocincta A. Nels. Lesser yellowthroat gilia. Ephemeral. Frequent, occasional. 586–1137 m. *DG12*.

Gilia stellata Heller. Star gilia. Ephemeral. Local, uncommon. 567–630 m. *DG66*.

Leptosiphon aureus (Nutt.) J. M. Porter & L. A. Johnson ssp. *aureus* [*Linanthus aureus* (Nutt.) Greene ssp. *aureus*]. Golden linanthus. Ephemeral. Local, uncommon; northern preserve. 854 m. *SJ1777*.

Phlox gracilis (Hook.) Greene [*Microsteris gracilis* (Hook.) Greene]. Slender phlox. Ephemeral. Scarce, uncommon; north–facing slope along Tom's Thumb trail. 1020 m. *SJ1752*.

Phlox tenuifolia E. E. Nelson. Santa Catalina Mountain phlox. Perennial forb. Scarce, rare. 814 m. *BS7.*

Polygonaceae

Chorizanthe brevicornu Torr. Brittle spineflower. Ephemeral. Frequent, uncommon. 586–1180 m. *CH9, BP20.*

Eriogonum abertianum Torr. Abert's buckwheat. Ephemeral. Scarce, rare; edge of volcanic tuff on Saddle Hill between Brown's Mountain and Cholla Mountain. 856 m. *SJ1810.*

Eriogonum deflexum Torr. var. *deflexum*. Flatcrown buckwheat. Ephemeral, riparian. Local, rare; disturbed areas. 725–839 m. *SJ1550.*

Eriogonum fasciculatum Benth. var. *foliolosum* S. Stokes. Coastal California buckwheat. Shrub. Scarce, rare. Planted in landscaped area at Tom's Thumb trailhead. 851 m. *SJ1829.*

Eriogonum fasciculatum Benth. var. *polifolium* (Benth.) Torr. & A. Gray. Eastern Mojave buckwheat. Shrub. Widespread, common. 612–1179 m. *JM19.*

Eriogonum inflatum Torr. & Frem. Desert trumpet. Perennial forb. Frequent, uncommon. 617–849 m. *JM6.*

Eriogonum palmerianum Reveal. Palmer's buckwheat. Ephemeral. Local, occasional; washes, granite grus. 619–1147 m. *SJ1479, MJ37.*

Eriogonum trichopes Torr. Little deserttrumpet. Ephemeral. Local, occasional; northern preserve. 816–843 m. *SJ1494.*

Eriogonum wrightii Torr. ex Benth. var. *wrightii*. Bastardsage. Perennial forb. Widespread, common; more common in north preserve. 700–1153 m. *SJ1591.*

Pterostegia drymarioides Fisch. & C. A. Mey. Woodland pterostegia. Ephemeral. Local, uncommon; shade of boulders, East End and Tom's Thumb. 956–998 m. *BS4.*

Rumex hymenosepalus Torr. Canaigre dock. Perennial forb. Local, occasional; washes in the northern preserve. 726 m. *SJ1754.*

Portulacaceae

**Portulaca oleracea* L. Little hogweed. Ephemeral. Local, common; large community at water tank just west of 128th St. 793–1132 m. *SJ1692.*

Portulaca pilosa L. Kiss me quick. Ephemeral. Scarce, rare; near Lookout Point trailhead; new Maricopa County record. 1139 m. *SJ1673.*

Portulaca umbraticola Kunth. Wingpod purslane. Ephemeral. Scarce, rare; TT trail, single location. 1132 m. *SJ s.n.* (photo).

Ranunculaceae

Anemone tuberosa Rydb. Tuber anemone. Perennial forb. Frequent, occasional; rocky slopes. 845–932 m. *SJ1376.*

Clematis drummondii Torr. & A. Gray. Drummond's clematis. Perennial vine. Frequent, occasional; washes. 747–837 m. *MJ44.*

Delphinium parishii A. Gray. Desert larkspur. Perennial forb. Local, uncommon; scattered in northern preserve, generally few in any location. 851–945 m. *MJ51.*

Delphinium scaposum Greene. Tall mountain larkspur. Perennial forb. Scarce, rare; single large colony. 953 m. *SJ1643.*

Rhamnaceae

Ziziphus obtusifolia (Hook. ex Torr. & A. Gray) A. Gray var. *canescens* (A. Gray) M. C. Johnston. Lotebush. Shrub. Widespread, occasional; mostly in washes in southern preserve; more widespread in northern preserve. 747–933 m. *SJ1506.*

Rosaceae

Cercocarpus montanus Raf. Alderleaf mountain mahogany. Shrub. Local, uncommon; rocky slopes of the East End and Tom's Thumb areas. 844–1100 m. *SJ1495, MJ11.*

Rubiaceae

Galium aparine L. Stickywilly. Ephemeral vine. Local, uncommon; shady moist areas. 814–845 m. *SJ1431.*

Galium stellatum Kellogg ssp. *eremicum* (Hilend & J. T. Howell) Ehrend. Starry bedstraw. Shrub. Widespread, occasional; rocky areas. 790–1155 m. *MJ2.*

Salicaceae

Populus fremontii S. Watson ssp. *fremontii.* Fremont cottonwood. Tree. Local, uncommon; Windmill site, Dixie Mine, Troon outflow. 684–756 m. *DG45.*

Salix gooddingii Ball. Goodding's willow. Tree. Local, uncommon; Windmill site, Dixie Mine, Troon outflow. 684–756 m. *SJ1528, DG46.*

Santalaceae

Phoradendron californicum Nutt. Mesquite mistletoe. Parasitic shrub. Widespread, occasional. 521–978 m. *BP9, BP19.*

Sapindaceae

Dodonaea viscosa (L.) Jacq. Florida hopbush. Shrub. Local, occasional; rocky, granitic slopes. 790–1100 m. *MJ8.*

Sapindus saponaria L. Wingleaf soapberry. Tree. Scarce, rare; single community in large wash north of Granite Mountain. 852 m. *SJ1778.*

Scrophulariaceae, see **Orobanchaceae**, **Phyrmaceae** and **Plantaginaceae**

Simmondsiaceae

Simmondsia chinensis (Link) Schneid. Jojoba. Shrub. Widespread, common. 514–1179 m. *SJ1366, BP12.*

Solanaceae

Datura discolor Bernh. Desert thorn-apple. Ephemeral forb. Local, uncommon. 770–822 m. *SJ1554, SJ1599.*

Lycium andersonii A. Gray var. *andersonii.* Water jacket. Shrub. Local, occasional; usually along washes. 796–844 m. *SJ1547.*

Lycium andersonii A. Gray var. *deserticola* (C. L. Hitchc.) C. L. Hitchc. ex Munz. Water jacket. Shrub. Scarce, rare; near Rio Verde Rd and 128th St. 782 m. *SJ1700.*

Lycium andersonii A. Gray var. *wrightii* A. Gray. Water jacket. Shrub. Scarce, rare; wash below Sven Towers. 820–873 m. *SJ1482.*

Lycium berlandieri Dunal. Berlandier's wolfberry. Shrub. Widespread, occasional. 518–1153 m. *SJ1660.*

Lycium exsertum A. Gray. Arizona desert-thorn. Shrub. Widespread, common. 612–1105 m. SJ1468, *MJ17.*

Lycium fremontii A. Gray. Fremont's desert-thorn. Shrub. Scarce, rare; single very large plant above stock tank in northwestern preserve. 739 m. *SJ1759.*

Nicotiana obtusifolia Mertens & Galeotti. Desert tobacco. Perennial forb. Frequent, uncommon; washes, boulder piles, disturbed areas. 736–929 m. *CH15.*

Physalis hederifolia A. Gray. Ivyleaf groundcherry. Perennial forb. Local, uncommon. 716–847 m. *DG41, SJ1515.*

Solanum douglasii Dunal. Greenspot nightshade. Perennial forb. Scarce, rare; below Glass Dome. 1096 m. *SJ1502.*

Solanum elaeagnifolium Cav. Silverleaf nightshade. Perennial forb. Scarce, uncommon; on Rio Verde Drive and on 128th St. 779–823 m. *SJ1665.*

Sterculiaceae, see **Malvaceae**

Tamaricaceae

**Tamarix chinensis* Lour. Five-stamen tamarisk. Tree. Local, uncommon; locations mapped by MSC. 690–829 m. *SJ1524, MJ22.*

Ulmaceae, see **Cannabaceae**

Urticaceae

Parietaria hespera Hinton var. *hespera.* Rillita pellitory. Ephemeral. Widespread, occasional; shady areas. 534–969 m. *BP3.*

Verbenaceae

Aloysia wrightii (A. Gray) A. Heller. Wright's beebrush. Shrub. Frequent, uncommon; rocky north-facing slopes. 754–1147 m. *MJ39.*

Glandularia gooddingii (Briq.) Solbrig. Southwestern mock vervain. Perennial forb. Scarce, uncommon. 785 m. *DG71.*

Verbena bracteata Cav. ex Lag. & Rodr. Bigbract verbena. Ephemeral. Scarce, occasional; cattle tanks. 738–788 m. *SJ1634.*

Viscaceae, see **Santalaceae**

Zygophyllaceae

Kallstroemia californica (S. Watson) Vail. California caltrop. Ephemeral. Scarce, rare; Black Hill Tank sediments northeast of Fraesfield Mountain. 785–1081 m. *SJ1563.*

Kallstroemia grandiflora Torr. ex A. Gray. Arizona poppy. Ephemeral. Local, rare; Ochoa Canyon north of Tom's Thumb; East End. 930–1135 m. *SJ1579.*

Kallstroemia parviflora J. B. S. Norton. Warty caltrop. Ephemeral. Scarce, rare; low area of wash west of house at Brown's Ranch. 823 m. *LM s.n., SJ s.n.* (photo).

Larrea tridentata (DC.) Coville. Creosote bush. Shrub. Widespread, common. 504–1169 m. *SJ1526, JP12.*

**Tribulus terrestris* L. Puncturevine. Ephemeral. Local, uncommon; disturbed areas; Black Hill Tank sediments northeast of Fraesfield Mountain. 786–828 m. *SJ1504, SJ1562.*

MAGNOLIOPHYTA—Liliopsida

Agavaceae, see **Asparagaceae**

Asparagaceae

Agave americana L. American century plant. Succulent. Scarce, rare; single plant near cistern in Ochoa Canyon north of Tom's Thumb; accidental or deliberate planting. 919 m. *SJ s.n.* (photo).

Agave deserti Engelm. var. *simplex* (Gentry) W. C. Hodgs. & Reveal. Desert agave. Succulent. Local, uncommon; from Windgate Pass to south and west of Dixie Mine. 880–1016 m. *MT s.n.* (photo), *SJ1813.*

Agave murpheyi F. Gibson. Murphey's century plant. Succulent. Scarce, rare; single colony east of McDowell Peak. 895 m. *SJ s.n.* (photo).

Agave toumeyana Trel. ex Standl. var. *toumeyana.* Toumey's century plant. Succulent. Scarce, rare; diorite exposure south of Tom's Thumb, Brown's Mountain. 940–1155 m. *WH27227.*

Dichelostemma capitatum (Benth.) Wood. Bluedicks. Perennial forb. Widespread, occasional. 824–1137 m. *SJ1373.*

Nolina microcarpa S. Watson. Sacahuista. Shrub. Scarce, rare; diorite exposure south of Tom's Thumb. Did not flower 2011/2012, flowered 2013. 1132–1153 m. *SJ1671.*

Yucca baccata Torr. Banana yucca. Shrub. Frequent, common; occcasionally abundant in northern preserve. Did not flower 2011/2012; flowered 2013. 612–1179 m. *SJ1765.*

Yucca elata Engelm. var. *elata.* Soaptree yucca. Shrub. Frequent, occasional; common in northern preserve. 783–857 m. *WH26939.*

Juncaceae

Juncus bufonius L. Toad rush. Ephemeral. Scarce, rare; grown from seed collected in wash north of Brown's Mountain, greenhouse study. 843 m. *CH48*(G).

Liliaceae

Calochortus kennedyi Porter var. *kennedyi*. Desert mariposa lily. Perennial forb. Scarce, uncommon; Windgate Pass north of McDowell Peak and diorite exposure south of Tom's Thumb. 742–1140 m. *SJ1435*.

Poaceae

Aristida adscensionis L. Sixweeks threeawn. Ephemeral. Widespread, occasional. 816–929 m. *SJ1379*.

Aristida divaricata Humb. & Bonpl. ex Willd. Poverty threeawn. Perennial forb. Local, occasional; northern preserve. 720–929 m. *SJ1489*.

Aristida pansa Woot. & Standl. Wooton's threeawn. Perennial forb. Scarce, rare; tuff exposure on Brown's Mountain. 831–842 m. *SJ1721*.

Aristida purpurea Nutt. var. *fendleriana* (Steud.) Vasey. Fendler's threeawn. Perennial forb. Frequent, uncommon. 527 m. *JP28*.

Aristida purpurea Nutt .var. *nealleyi* (Vasey) Allred. Blue threeawn. Perennial forb. Local, uncommon. 777–1151 m. *SJ1490*.

Aristida purpurea Nutt. var. *parishii* (Hitchc.) Allred. Parish's threeawn. Perennial forb. Local, occasional. 830–845 m. *SJ1375*, *SJ1436*, *MJ9*.

Aristida purpurea Nutt. var. *purpurea*. Purple threeawn. Perennial forb. Widespread, occasional. 823 m. *SJ1450*.

**Avena fatua* L. Wild oat. Ephemeral. Local, uncommon. 684–888 m. *SJ1432*.

Bothriochloa barbinodis (Lag.) Herter. Cane bluestem. Perennial forb. Local, uncommon. 772–881 m. *BS13*.

Bouteloua aristidoides (Kunth) Griseb. Needle grama. Ephemeral. Local, occasional. 785–1126 m. *SJ1561*.

Bouteloua barbata Lag. var. *barbata*. Sixweeks grama. Ephemeral. Local, uncommon. 789–1126 m. *SJ1575*.

Bouteloua curtipendula (Michx.) Torr. var. *caespitosa* Gould & Kapadia. Sideoats grama. Perennial forb. Local, occasional. 831–1155 m. *SJ1593*.

Bromus arizonicus (Shear) Stebbins. Arizona brome. Ephemeral. Local, uncommon. 888–956 m. *SJ1386*, *MJ1*.

**Bromus arvensis* L. Field brome. Ephemeral. Scarce, rare. 790 m. *MJ5*.

**Bromus berteroanus* Colla. Chilean chess. Ephemeral. Scarce, rare. 790 m. *MJ4*.

Bromus carinatus Hook. & Arn. Arizona brome. Ephemeral. Frequent, uncommon. 774–1102 m. *SJ1414*.

Bromus marginatus Nees Ex Steud. Mountain brome. Ephemeral. Local, uncommon. 620–929 m. *SJ1507*.

**Bromus rubens* L. Red brome. Ephemeral. Widespread, abundant. 504–1169 m. *SJ1360*, *BP7*.

**Cynodon dactylon* (L.) Pers. Bermudagrass. Perennial forb. Local, uncommon. 688–833 m. *BS12*.

Dasyochloa pulchella (Kunth) Willd. ex Rydb [*Erioneuron pulchellum* (Kunth) Tateoka]. Low woollygrass. Perennial forb. Widespread, occasional. 740–1153 m. *CH2*.

Digitaria californica (Benth.) Henr. Arizona cottontop. Perennial forb. Local, uncommon; East End, northern preserve. 792–1135 m. *SJ1667*.

Dinebra panicea (Retz.) P. M. Peterson & N. Snow ssp. *brachiata* (Steud.) P. M. Peterson & N. Snow [*Leptochloa panicea* (Retz.) Ohwi ssp. *brachiata* (Steudl.) N. W. Snow]. Mucronate sprangletop. Ephemeral. Local, uncommon; East End and Brown's Mountain areas. 831–979 m. *CE4*, *SJ1723*.

Disakisperma dubium (Kunth) P. M. Peterson & N. Snow [*Leptochloa dubia* (Kunth) Nees]. Green sprangletop. Perennial forb. Scarce, uncommon; tuff exposure at Brown's Mountain. Tall, fall–flowering grass. 831–842 m. *SJ1724*.

Elymus elymoides (Raf.) Swezey. Squirreltail. Ephemeral. Local, uncommon; north slope Brown's Mountain and wash to south. 824–966 m. *SJ1647.*

Enneapogon desvauxii Desv. ex P. Beauv. Nineawn pappusgrass. Perennial forb. Scarce, common; relict grassland community on Brown's Mountain. Fall-flowering perennial. 822–842 m. *SJ1594.*

**Eragrostis cilianensis* (All.) Vign. ex Janchen. Stinkgrass. Ephemeral. Scarce, rare; wash below tuff exposure on Brown's Mountain. Fall-flowering grass. 824 m. *SJ1797.*

Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult. Tanglehead. Perennial forb. Scarce, rare; three small groups in northern preserve and one small group near Lookout Point south of Tom's Thumb. 866–1122 m. *SJ1809.*

Hilaria belangeri (Steud.) Nash. Curly-mesquite. Perennial forb. Scarce, occasional. 897 m. *SJ s.n.* (photo).

Hilaria rigida (Thurb.) Benth. ex Scribn. [*Pleuraphis rigida* Thurb.]. Big galleta. Perennial forb. Local, uncommon. 809–844 m. *SJ1448.*

**Hordeum murinum* L. ssp. *glaucum* (Steud.) Tzvelev [*H. stebbinsii* Covas; *H. glaucum* Steud.]. Smooth barley. Ephemeral. Local, uncommon. 619–819 m. *SJ1381.*

**Hordeum murinum* L. ssp. *leporinum* (Link) Arcang. Leporinum barley. Ephemeral. Local, uncommon. 785–820 m. *JB1.*

Muhlenbergia emersleyi Vasey. Bullgrass. Perennial forb. Scarce, rare; relict grassland community on northeast-facing slope of Brown's Mountain. 865–880 m. *SJ1618.*

Muhlenbergia microsperma (DC.) Trin. Littleseed muhly. Ephemeral. Local, rare; northern preserve. 840–881 m. *CH3.*

Muhlenbergia porteri Scribn. ex Beal. Bush muhly. Perennial forb. Frequent, occasional. 754–1151 m. *SJ1421.*

Panicum hirticaule J. Presl. ssp. *hirticaule*. Mexican panicgrass. Ephemeral. Scarce, rare. 822–1081 m. SJ1582.

Pappostipa speciosa (Trin. & Rupr.) Romasch. [*Achnatherum speciosum* (Trin. & Rupr.) Barkworth]. Desert needlegrass. Perennial forb. Local, occasional; diorite exposure, Tom's Thumb, East End, northern preserve. 929–1151 m. *SJ1498.*

**Pennisetum ciliare* (L.) Link. Buffelgrass. Perennial forb. Local, uncommon. 527–1122 m. *SJ1510, JP27.*

**Pennisetum setaceum* (Forssk.) Chiov. Crimson fountaingrass. Perennial forb. Local, uncommon; washes and slopes. 584–1118 m. *SJ1361.*

**Phalaris minor* Retz. Littleseed canarygrass. Ephemeral. Scarce, rare; in Black Hill Tank sediments northeast of Fraesfield Mountain. 785 m. *SJ1774.*

Poa bigelovii Vasey & Scribn. Bigelow's bluegrass. Ephemeral. Frequent, uncommon; shady areas. 516–1153 m. *BS2.*

**Polypogon monspeliensis* (L.) Desf. Annual rabbitsfoot grass. Ephemeral. Scarce, rare; cattle tank under power line. 738 m. *SJ1638.*

**Schismus arabicus* Nees. Arabian schismus. Ephemeral. Widespread, abundant. 534–1169 m. *SJ1388.*

**Schismus barbatus* (Loefl. ex L.) Thell. Common Mediterranean grass. Ephemeral. Widespread, abundant. 534–1169 m. *BP6.*

Sporobolus cryptandrus (Torr.) A. Gray. Sand dropseed. Perennial forb. Scarce, rare. 824–1153 m. *SJ1670, SJ1807.*

Tridens muticus (Torr.) Nash var. *muticus*. Slim tridens. Perennial forb. Local, uncommon. 735–1155 m. *SJ1437, MJ25.*

Urochloa arizonica (Scribn. & Merr.) O. Morrone & F. Zuloaga. [*Panicum arizonicum* Scribn. & Merr.] Arizona signalgrass. Ephemeral. Scarce, rare. 1126 m. *SJ1674.*

Vulpia microstachys (Nutt.) Munro var. *ciliata* (Beal) Lonard & Gould. Eastwood fescue. Ephemeral. Local, uncommon. 765–1137 m. *MJ3.*

Vulpia microstachys (Nutt.) Munro var. *pauciflora* (Scribn. ex Beal) Lonard & Gould. Pacific fescue. Ephemeral. Local, occasional. 845–969 m. *BS3.*

Vulpia octoflora (Walter) Rydb. var. *octoflora*. Sixweeks fescue. Ephemeral. Widespread, occasional. 717–965 m. *SJ1405.*

Typhaceae

Typha domingensis Pers. Southern cattail. Perennial forb. Scarce, rare; Frazier Spring on Tom's Thumb trail. 767–974 m. *CH37.*

ACKNOWLEDGEMENTS

The authors thank the Nina Mason Pulliam Charitable Trust for funding this study. We greatly appreciate the support and direction provided by Lesley Forst and Melanie Tluczek of the McDowell Sonoran Conservancy. We thank Claire Miller, Robbin Schweitzer, Scott Hamilton and Kroy Ekblaw of the City of Scottsdale for support, direction and for providing the necessary permits. Wendy Hodgson, Liz Makings, Brenton Scott and Liz Slauson provided valuable advice and assistance in the field and in the herbarium, and we thank them very much. Thanks also to Les Landrum for identification of several specimens, to Don Pinkava for assistance with identification of the *Ambrosia* hybrid, and to Michael Windham for confirmation of the specimen of *Astrolepis windhamii*. Special thanks to the MSC stewards who participated in the parabotanist/lead collector training and collected a large number of the specimens, Con Englehorn, Dan Gruber, Marianne Jensen, Joni Millavec, Joyce Peters, and Barb Pringle. Thanks also to the MSC stewards who joined in the organized collection events, Paul Brosseit, Denise Carpenter, Carol Carriere, Sandy Fefes, Bernie Finkel, Judi Irons, Lisa Miller, Jim Smith and Kathy Ann Walsh, and the many others, stewards and not, who participated in fieldwork and specimen processing. Thanks to Walter Fertig, Sarah Hunkins and Les Landrum for reviewing the manuscript, to Brian Gootee and Len Marcisz for reviewing portions of the manuscript, and to Dan Gruber and Melanie Tluczek for helpful comments.

LITERATURE CITED

BALDWIN, B. G., D. W. KYHOS, S. N. MARTENS, F. C. VASEK and B. L. WESSA. 1996. Natural hybridization between species of *Ambrosia* and *Hymenoclea salsola* (Compositae). *Madroño* 43: 15–27.

BROWN, D. E., and C. H. LOWE. 1982. Biotic Communities of the Southwest. Rocky Mountain Forest and Range Experimental Station, U.S. Forest Service. General Technical Report RM-78 (map).

CAMP, P. D. 1986. Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, Arizona. United States Department of Agriculture, Soil Conservation Service. Government Printing Office, Washington, D. C.

DANIEL, T. F. and M. L. BUTTERWICK. 1992. Flora of the South Mountains of south-central Arizona. *Desert Plants* 10: 99–119.

DIMMITT, M. A. 2000. Biomes and communities of the Sonoran desert region. Pp. 3–18. *In:* S. J. Phillips and P. Wentworth Comus (eds.). *A Natural History of the Sonoran Desert: Arizona-Sonora Desert Museum.* University of California Press, Berkeley.

DOORN, P. L. and T. L. PÉWÉ. 1991. Geologic and Gravimetric Investigations of the Carefree Basin, Maricopa County, Arizona. Arizona Geological Survey Special Paper 8.

FLORA OF NORTH AMERICA EDITORIAL COMMITTEE, eds. 1993+. Flora of North America North of Mexico. 16+ vols. New York and Oxford.

HARRINGTON, H. D. 1957. *How to identify plants*. The Swallow Press, Chicago.

GOLDMAN, D. and WARD, J. 2010. A survey of the vascular flora in the area of Lime Creek, Maricopa County, Arizona: a unique upland Sonoran desert environment. *Canotia* 6: 1–25.

HODGSON, W. C. 2001. *Food Plants of the Sonoran Desert*. The University of Arizona Press, Tucson, Arizona.

JONES, T. 2012. Broken Down Cowboys: A summary of ranching in North Scottsdale and the McDowell Sonoran Preserve, Maricopa County, Arizona 1915–1970. Archaeological Consulting Services Project 12-106-HDOC.

KEARNEY, T. H., R. H. PEEBLES and collaborators. 1960. *Arizona Flora*. 2nd ed. University of California Press, Berkeley.

LANE, M. A. 1981. Vegetation and flora of McDowell Mountain Regional Park, Maricopa County, Arizona. *Journal of the Arizona-Nevada Academy of Science* 16: 29–38.

LUND, B. 2011. Vascular plant flora of the Hummingbird Springs Wilderness. *Canotia* 7: 14–40.

MENSING, S. and R. BYRNE. 1998. Pre-mission invasion of *Erodium cicutarium* in California. *Journal of Biogeography* 25: 757–762.

NATIONS, D. and E. STUMP. 1981. Landforms. Pp. 79–97. *In*: D. Nations and E. Stump. *Geology of Arizona*. Kendall/Hunt Publishing Company, Dubuque.

SALO, L. F. 2005. Red brome (*Bromus rubens* subsp. *madritensis* [*sic*]) in North America: possible modes for early introduction, subsequent spread. *Biological Invasions* 7: 165–180.

SOUTHWEST ENVIRONMENTAL INFORMATION NETWORK, SEINet. 2013. http://swbiodiversity.org/seinet/index.php. Accessed May to August.

SKOTNICKI, S. J. 1996. Geologic Map of Portions of the Fort McDowell and McDowell Peak quadrangles, Maricopa County, Arizona. Arizona Geological Survey Open File Report 96–11.

STEVENS, P. F. (2001 onwards). Angiosperm Phylogeny Website. Version 12, July 2012 [and more or less continuously updated since]. http://www.mobot.org/MOBOT/research/APweb/. Accessed in January 2014.
UNITED STATES DEPARTMENT OF AGRICULTURE (USDA). 2013. The PLANTS Database. http://plants.usda.gov/. Accessed in July.

VAN DEVENDER, T.R. and M.L. DIMMITT. 1999. Desert grasses. Pp. 265–280. *In:* S. J. Phillips and P. Wentworth Comus (eds.). *A Natural History of the Sonoran Desert: Arizona-Sonora Desert Museum*. University of California Press, Berkeley.

VASCULAR PLANTS OF ARIZONA EDITORIAL COMMITTEE. 1992+. Vascular Plants of Arizona. *Journal of the Arizona-Nevada Academy of Science* and *Canotia* (all contributions are available at http://www.canotia.org/vpa_project.html). Accessed July 2013.

WRIGHT, T. E. 2002. Archaeological overview. Pp. 9-16. *In* T. E. Wright. Archaeological testing of AZ U:1:25 (ASM), the Brown's Ranch rock shelter site, in Northern Scottsdale, Maricopa County, Arizona. *The Arizona Archaeologist* 33.

Appendix A. Previous collections from within the current preserve boundaries. Jones specimens are in his personal collection.

Astrolepis cochisensis var. *cochisensis*	Cates s.n. (ASU)
Ephedra aspera	Cates s.n. (ASU)
Adenophyllum porophylloides	Jones 599
Ambrosia deltoidea	Cates s.n. (ASU)
Cirsium neomexicanum	Jones 608
Erigeron divergens	Jones 574
Machaeranthera pinnatifida	Cates s.n. (ASU)
Stephanomeria pauciflora	Jones 603
Amsinckia intermedia	Cates s.n. (ASU)
Plagiobothrys arizonicus	Cates s.n. (UCR)
Cylindropuntia acanthocarpa var. *major*	Cates s.n. (ASU, UCR)
Cylindropuntia bigelovii	Cates s.n. (ASU, UCR)
Cylindropuntia leptocaulis	Cates s.n. (ASU)
Chamaesyce arizonica	Jones 604
Chamaesyce melanadenia	Cates s.n. (ASU)
Astragalus nuttallianus	Jones 605
Parkinsonia florida	Cates s.n. (ASU)
Fouquieria splendens	Cates s.n. (ASU)
Phacelia distans	Cates s.n. (ASU)
Krameria erecta	Cates s.n. (ASU)
Marrubium vulgare	Jones 607
Mentzelia involucrata	Smith s.n. (ASU)
Janusia gracilis	Jones 600
Malva parviflora	Jones 606
Menodora scabra	Jones 598
Orobanche cooperi	Cates s.n. (ASU)
Claytonia perfoliata	Jones 580
Galium aparine	Jones 573
Galium stellatum ssp. *eremicum*	Jones 581, 601
Castilleja applegatei ssp. *martinii*	Jones 577
Penstemon subulatus	Jones 579
Simmondsia chinensis	Jones 575, 576
Aloysia wrightii	Jones 602
Glandularia bipinnatifida var. *bipinnatifida*	Cates s.n. (ASU, UCR)
Larrea tridentata	Cates s.n. (ASU)
Agave murpheyi	Hodgson 8102 (ASU, DES)
Aristida adscensionis	Cates s.n. (ASU)
Hilaria belangeri	Hodgson 8103 (ASU, DES)
Vulpia microstachys var. *ciliata*	Jones 578

Appendix B. Collectors and the location of their material.

JB	Jen Bruening	ASU
CE	Con Englehorn	DES
DG	Dan Gruber	DES
CH	Chelsey Hull	ASU
WH	Wendy Hodgson	DES
MJ	Marianne Jensen	DES, General Observations (SEINet)
SJ	Steve Jones	ASU, General Observations (SEINet)
LM	Liz Makings	ASU
JM	Joni Millavec	DES
JP	Joyce Peters	DES
BP	Barb Pringle	DES
BS	Brenton Scott	ASU
MT	Melanie Tluczek	General Observations (SEINet)

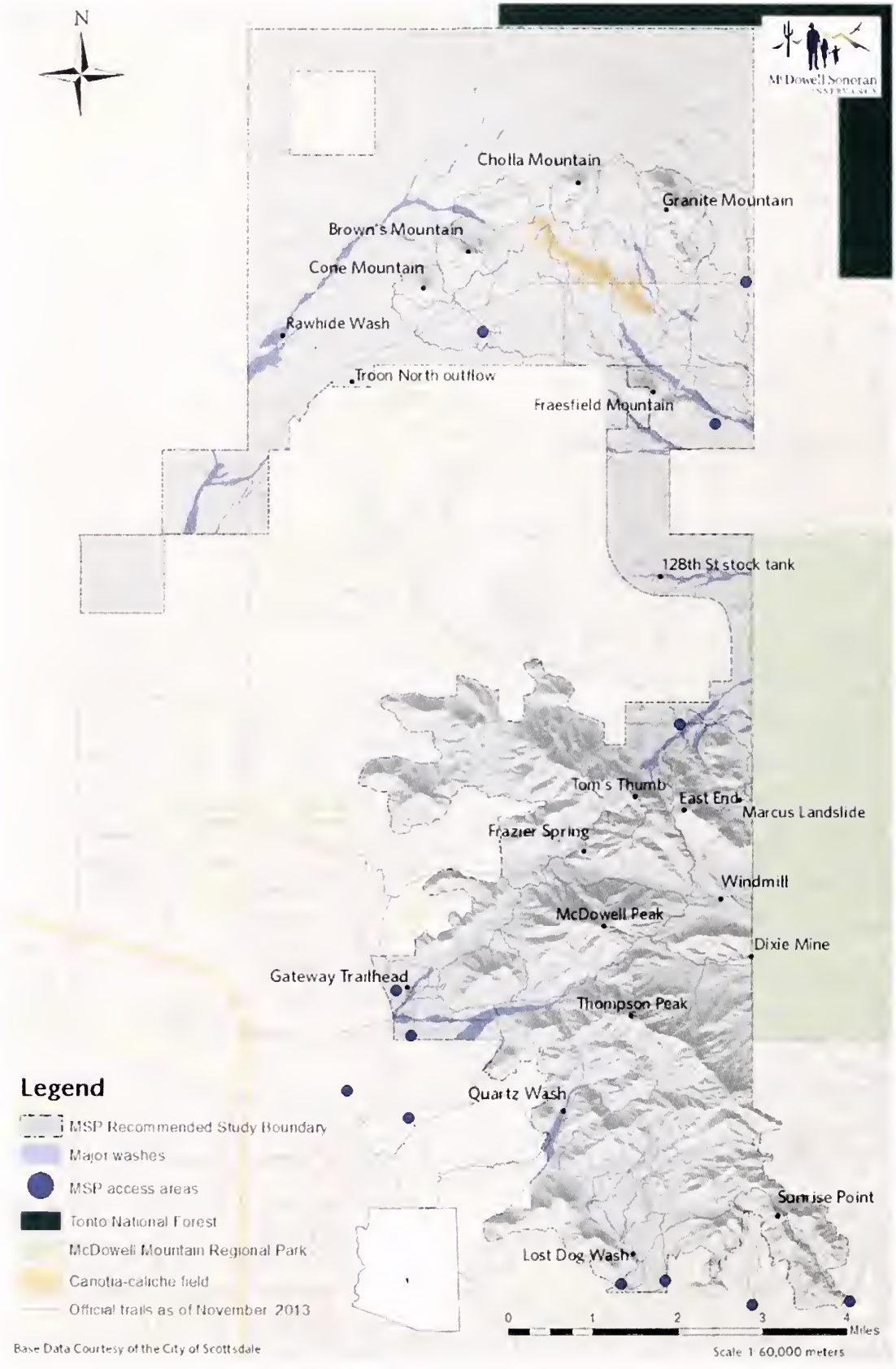

Figure 1. McDowell Sonoran Preserve study area boundary and place names.

Figure 2. (A) McDowell Mountain range in the background with Pinnacle Peak Pediment in the foreground, looking southwest from near McDowell Mountain Regional Park boundary. (B) *Agave murpheyi* on eastern slope of McDowell Peak; single large plant and several smaller ones, with numerous old remains. (C) Tree-like *Canotia holacantha* on caliche exposure south of Cholla Mountain. (D) Tube-like woody remains of *Canotia holacantha* burned in 1992 Granite fire. These were common in burned areas where *C. holacantha* grew. (E) Many *Peniocereus greggii* var. *transmontanus* like this one were left exposed by the 1995 Rio fire. (F) Greenhouse trays one month after planting.

Figure 3. (A) Putative hybrid of *Ambrosia ambrosioides* × *Ambrosia salsola*, male and female inflorescences. (B) *Ambrosia ambrosioides* × *Ambrosia salsola*, leaves with Eriophyid mite galls. (C) New Maricopa County record: *Astrolepis windhamii*. (D) New Maricopa County record: *Allionia choisyi*. (E) New Maricopa County record: *Portulaca pilosa*. Note swollen taproot. (F) Greenhouse-grown *Juncus bufonius*, cultivated from a soil sample collected in a major wash through Brown's Ranch.

New Records for the Flora of Arizona

Juncaceae

Juncus bryoides F.J. Hermann. *Juncus bryoides* is a dwarf, annual rush with stems under 25 mm tall that are terminated by a single flower. The scape and flower or fruit resemble the sporophyte of a moss, accounting for its specific epithet, *bryoides* (moss-like). This species is native and occurs sporadically from southern Oregon and Idaho to western Colorado, southern Utah, southern California, and Mexico (Brooks and Clemants 2000). In Arizona it is presently known from a single specimen (*Marc A. Baker, Theresa Wright, and Ian Trushell 10686*, ASU #19826) collected in Yavapai County on 2 May 1993. This population was found northwest of Prescott, 3.1 km southeast of Stinson Mountain near the intersection of Forest roads 705 and 9897B on Prescott National Forest. The Arizona population represents a range extension of nearly 300 km from the nearest known population in southern Kane County, Utah (*Fertig 21907*, BRY).

The collection by Baker, Wright, and Trushell was originally identified as *Juncus sphaerocarpus* Nees, and will key to this taxon in the *Arizona Flora* (Kearney and Peebles 1960). The name *Juncus sphaerocarpus* may belong to an unrelated Mediterranean species not found in North America (Cronquist et al. 1977). Recent floras have treated *J. sphaerocarpus* as a synonym of *J. bufonius* L. var. *occidentalis* F.J. Herm. (Zika 2012) or ignored it completely (Brooks and Clemants 2000).

I first encountered the *Baker et al.* collection while imaging the ASU *Juncus* collections for SEINet in May 2014. I immediately recognized the diminutive specimen as being *Juncus bryoides*, based on my field experience with the species in southern Utah. *Juncus bryoides* and *J. bufonius* are the only annual *Juncus* species in the flora of Arizona, but can be readily distinguished by their stature and inflorescence characters (Figure 1). *Juncus bryoides* has a basal cluster of leaves and leafless scapes averaging 3-20 mm long, topped by a solitary, reddish-purple, flower with tepals 1.5-2.3 mm long. By contrast, *J. bufonius* typically has leafy stems up to 30 cm tall and a branched, raceme-like interrupted spike of 2-20 flowers, with greenish or hay-colored sepals over 3 mm long.

The population of *J. bryoides* from Yavapai County, Arizona, is unusual in being from a barren site within a pine-oak woodland. Welsh et al. (2008) report this species from conifer, aspen, and mountain brush communities, but usually associated with washes, springs, or seeps. Populations from southern Utah are associated with ephemeral wetlands found in stabilized sand dunes derived from Navajo Sandstone. Similar habitats are likely to occur in the Arizona Strip in northern Coconino, Mohave, Navajo, and Apache counties. Due to the plant's tiny size, it is easily overlooked and may be more widespread than presently known.

Acknowledgments

My herbarium assistant, Beedemariam Kassaw, first brought this collection to my attention when he couldn't get the camera to properly focus on the tiny plants I was asking him to photograph. Max Licher and Glenn Rink, who are working on a treatment of Juncaceae for the Vascular Plants of Arizona Project, corroborated the identification.

LITERATURE CITED

BROOKS, R.E. and S.E. CLEMANTS. 2000. Juncaceae. Pp 211-267. In: Flora of North America Editorial Committee. *Flora of North America, North of Mexico. Volume 22: Magnoliophyta: Alismatidae, Arecidae, Commelinidae (in part), and Zingiberidae*. Oxford University Press, New York. 352 pp.

CRONQUIST, A., A.H. HOLMGREN, N.H. HOLMGREN, J.L. REVEAL, and P.K. HOLMGREN. 1977. *Intermountain Flora, Vascular Plants of the Intermountain West, U.S.A. Volume Six, The Monocotyledons*. New York Botanical Garden, Bronx, NY. 584 pp.

KEARNEY, T.H. and R. H. PEEBLES. 1960. *Arizona Flora, second edition with supplement*. University of California Press, Berkeley, CA. 1085 pp.

WELSH, S.L., N.D. ATWOOD, S. GOODRICH, and L.C. HIGGINS. 2008. *A Utah Flora, fourth edition, revised*. Print Services, Brigham Young University, Provo, UT. 1019 pp.

ZIKA, P.F. 2012. Juncaceae. Pp 1361-1375. In: Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosattii, and D.H. Wilken, eds. *The Jepson Manual: Vascular Plants of California, second edition*. University of California Press, Berkeley, CA. 1568 pp.

—Walter Fertig, Herbarium, Arizona State University, Tempe, Arizona, wfertig@asu.edu

Figure 1. One plant of *Juncus bufonius* (*Keil 11425*, ASU) on left compared with several plants of *J. bryoides* (*Baker et al. 10686*, ASU) on right.

New York Botanical Garden Library
3 5185 00322 5107

Index to Families of the Vascular Plants of Arizona

Bolded treatments are published in volumes 26, 27, 29, 30, 32, 33, and 35 of the *Journal of the Arizona-Nevada Academy of Science* (JANAS) or in subsequent volumes (e.g., 1–10) of CANOTIA. Unbolded entries indicate families with no treatments published to date. Figure numbers refer to illustrations in the "Key to Families of Vascular Plants in Arizona" in JANAS 35(2). Selected VPA treatments originally published in JANAS are also available as pdf files online (http://www.canotia.org/vpa_project.html).

Acanthaceae (Fig. 3)
Aceraceae JANAS 29(1):2. 1995. (L.R. Landrum)
Adiantaceae (Fig. 1)
Agavaceae Part 1: *Agave* JANAS 32(1):1. 1999. (W. Hodgson)
Aizoaceae Alismataceae Amaranthaceae (Fig. 4)
Anacardiaceae CANOTIA 3(2):13. 2007. (J.L. Anderson)
Apiaceae (Fig. 5)
Apocynaceae JANAS 27(2):164. 1994. (S.P. McLaughlin)
Araceae
Araliaceae
Arecaceae JANAS 32(1):22. 1999. (C.T. Mason, Jr.)
Aristolochiaceae JANAS 32(1):24. 1999. (C.T. Mason, Jr.)
Asclepiadaceae JANAS 27(2):169. 1994. (E. Sundell)
Aspleniaceae
Asteraceae (Figs. 6–7)
Azollaceae CANOTIA 4(2):31. 2008. (G. Yatskievych and M.D. Windham)
Berberidaceae JANAS 26(1):2. 1992. (J.E. LaFerriere; Fig. 9)
Betulaceae JANAS 33(1):1. 2001. (J.W. Brasher)
Bignoniaceae JANAS 32(1):26. 1999. (C.T. Mason, Jr.)
Bixaceae JANAS 27(2):188. 1994. (W. Hodgson)
Blechnaceae CANOTIA 4(2):35. 2008. (G. Yatskievych and M.D. Windham; Fig. 1)
Boraginaceae (Fig. 9)
Brassicaceae
Bromeliaceae CANOTIA 3(2):23. 2007. (R. Gutierrez, Jr.)
Buddlejaceae JANAS 26(1):5. 1992. (E.M. Norman)
Burseraceae JANAS 32(1):29. 1999. (A. Salywon)
Cactaceae Part One: The Cereoid Cacti JANAS 29(1):6. 1995. (D.J. Pinkava)
Cactaceae Part Two: *Echinocactus* JANAS 29(1):13. 1995. (M. Chamberland)
Cactaceae Part Three: *Cylindropuntia* JANAS 32(1):32. 1999. (D.J. Pinkava)
Cactaceae Part Four: *Grusonia* JANAS 32(1):48. 1999. (D.J. Pinkava)
Cactaceae Part Five: *Pediocactus* and *Sclerocactus* JANAS 33(1):9. 2001. (K.D. Heil and J.M. Porter)
Cactaceae Part Six: *Opuntia* JANAS 35(2):137. 2003. (D.J. Pinkava).
Callitrichaceae JANAS 29(1):15. 1995. (J. Ricketson)
Campanulaceae
Cannabaceae JANAS 32(1):53. 1999. (C.T. Mason, Jr.)
Capparaceae (Fig. 8)
Caprifoliaceae (Fig. 10)
Caryophyllaceae (Fig. 10)
Celastraceae JANAS 30(2):57. 1998. (J.W. Brasher)
Ceratophyllaceae JANAS 29(1):17. 1995. (J. Ricketson)
Chenopodiaceae (Fig. 9)
Clusiaceae
Commelinaceae JANAS 33(1):19. 2001. (R. Puente and R. Faden)
Convolvulaceae JANAS 30(2):61. 1998. (D.F. Austin)
Cornaceae
Crassulaceae JANAS 27(2):190. 1994. (R. Moran)
Crossosomataceae JANAS 26(1):7. 1992. (C. Mason)
Cucurbitaceae (Fig. 10)
Cupressaceae JANAS 27(2):195. 1994. (J. Bartel)
Cuscutaceae
Cyperaceae (Fig. 18)
Dennstaedtiaceae CANOTIA 4(2):38. 2008. (G. Yatskievych and M.D. Windham; Fig. 1)
Dipsaceae JANAS 27(2):201. 1994. (J.E. LaFerriere)
Dryopteridaceae (Fig. 1)
Elaeagnaceae
Elatinaceae
Ephedraceae (Fig. 2)
Ericaceae CANOTIA 4(2):21. 2008. (J.L. Anderson; Fig. 11)
Euphorbiaceae Part One: *Acalypha* and *Cnidoscolus* JANAS 29(1):18. 1995. (G.A. Levin)
Equisetaceae CANOTIA 4(2):41. 2008. (G. Yatskievych and M.D. Windham)
Fabaceae Part One: *Errazuria*, *Marina*, *Parryella*, and *Psorothamnus* CANOTIA 7:1. 2011 (S. Rhodes, J. Beasley, and T. Ayers; Figs. 12–13)
Fagaceae JANAS 27(2):203. 1994. (L.R. Landrum)
Fouquieriaceae JANAS 32(1):55. 1999. (C.T. Mason, Jr.)
Fumariaceae JANAS 33(1):27. 2001. (S. Holiday and A. Perez)
Garryaceae JANAS 33(1):31. 2001. (R. Puente and T.F. Daniel)
Gentianaceae JANAS 30(2):84. 1998. (C.T. Mason, Jr.)
Geraniaceae (Fig. 14)
Grossulariaceae
Haloragaceae
Hippuridaceae JANAS 29(1):25. 1995. (J. Ricketson)
Hydrangeaceae
Hydrocharitaceae
Hydrophyllaceae (Fig. 14)
Iridaceae Part One: *Sisyrinchium* JANAS 27(2):215. 1994. (A.F. Cholewa and D.M. Henderson)
Iridaceae Part Two: *Iris* and *Nemastylis* JANAS 33(1):35. 2001. (C.T. Mason, Jr.)
Isoëtaceae CANOTIA 5(1):27. 2009. (G. Yatskievych and M.D. Windham)
Juglandaceae JANAS 27(2):219. 1994. (J.E. LaFerriere)
Juncaceae (Fig. 19)
Juncaginaceae
Key to Families of Vascular Plants in Arizona JANAS 35(2):88. 2003. (D.J. Keil)
Krameriaceae JANAS 32(1):57. 1999. (B.B. Simpson and A. Salywon)
Lamiaceae Part One: *Agastache, Hyptis, Lamium, Leonurus, Marrubium, Monarda, Monardella, Nepeta, Salazaria, Stachys, Teucrium, and Trichostema* JANAS 35(2):151. 2003. (C.M. Christy, D.Z. Damrel, A. Henry, A. Trauth- Nare, R. Puente-Martinez, and G. Walters)
Lemnaceae JANAS 26(1):10. 1992. (E. Landolt)
Lennoaceae JANAS 27(2):220. 1994. (G. Yatskievych)
Lentibulariaceae CANOTIA 8(2):54-58. 2012. (B. Rice)
Liliaceae (Fig. 19)
Linaceae
Loasaceae JANAS 30(2):96. 1998. (C.M. Christy)
Lythraceae
Malpighiaceae
Malvaceae Part One: All genera except *Sphaeralcea*. JANAS 27(2):222. 1994. (P.A. Fryxell)
Marsileaceae CANOTIA 5(1):30. 2009. (G. Yatskievych and M.D. Windham)
Martyniaceae CANOTIA 3(2):26. 2007. (R. Gutierrez, Jr.)
Meliaceae
Menispermaceae JANAS 27(2):237. 1994. (J.E. LaFerriere)
Menyanthaceae JANAS 33(1):38. 2001. (C.T. Mason, Jr.)
Monotropaceae JANAS 26(1):15. 1992. (E. Haber)
Molluginaceae JANAS 30(2):112. 1998. (C.M. Christy)
Moraceae
Najadaceae
Nyctaginaceae (Fig. 14)
Nymphaeaceae JANAS 29(1):26. 1995. (J. Ricketson)
Oleaceae (Fig. 15)

Onagraceae (Fig. 15)
Ophioglossaceae
Orchidaceae
Orobanchaceae
Oxalidaceae JANAS 30(2):115. 1998. (R. Ornduff and M. Denton)
Papaveraceae JANAS 30(2):120. 1998. (G.B. Ownbey with contributions by J.W. Brasher and C. Clark)
Passifloraceae JANAS 33(1):41. 2001. (J.M. MacDougal)
Phytolaccaceae JANAS 33(1):46. 2001. (V. Steinmann)
Pinaceae
Plantaginaceae JANAS 32(1):62. 1999. (K.D. Huisinga and T.J. Ayers)
Platanaceae JANAS 27(2):238. 1994. (J.E. LaFerriere)
Plumbaginaceae
Poaceae (Fig. 20)
Polemoniaceae CANOTIA 1:1. 2005. (D. Wilken and M. Porter)
Polygalaceae
Polygonaceae (Fig. 15)
Polypodiaceae CANOTIA 5(1):34. 2009. (G. Yatskievych and M.D. Windham; Fig. 1)
Pontederiaceae JANAS 30(2):133. 1998. (C.N. Horn)
Portulacaceae CANOTIA 2(1):1. 2006. (A. Bair, M. Howe, D. Roth, R. Taylor, T. Ayers, and R.W. Kiger)
Potamogetonaceae
Primulaceae JANAS 26(1):17. 1992. (A.F. Cholewa; Fig. 16)
Psilotaceae CANOTIA 3(2):32. 2007. (R. Gutierrez, Jr.)
Pyrolaceae JANAS 26(1):22. 1992. (E. Haber)
Rafflesiaceae JANAS 27(2):239. 1994. (G. Yatskievych)
Ranunculaceae (Fig.15)
Resedaceae
Rhamnaceae CANOTIA 2(1):23. 2006. (K. Christie, M. Currie, L. Smith Davis, M-E. Hill, S. Neal, and T. Ayers)
Rosaceae Part One: *Rubus*. JANAS 33(1):50. 2001. (J.W. Brasher)
Rubiaceae JANAS 29(1):29. 1995. (L. Dempster and E.T. Terrell; Fig. 16)
Ruppiaceae
Rutaceae
Salicaceae Part One: *Populus*. JANAS 26(1):29. 1992. (J.E. Eckenwalder)
Salicaceae Part Two. *Salix*. JANAS 29(1):39. 1995. (G.W. Argus)
Salviniaceae CANOTIA 4(2):50. 2008. (G. Yatskievych and M.D. Windham)
Santalaceae JANAS 27(2):240. 1994. (J.E. LaFerriere)
Sapindaceae JANAS 32(1):76. 1999. (A. Salywon)
Sapotaceae JANAS 26(1):34. 1992. (L.R. Landrum)
Saururaceae JANAS 32(1):83. 1999. (C.T. Mason, Jr.)
Saxifragaceae JANAS 26(1):36. 1992. (P. Elvander; Fig. 16)
Scrophulariaceae (Fig. 17)
Selaginellaceae CANOTIA 5(1):39. 2009. (G. Yatskievych and M.D. Windham)
Simaroubaceae JANAS 32(1):85. 1999. (J.W. Brasher)
Simmondsiaceae JANAS 29(1):63. 1995. (J. Rebman)
Solanaceae Part One: *Datura*. JANAS 33(1):58. 2001. (R. Bye)
Solanaceae Part Two: Key to the Genera and *Solanum*. CANOTIA 5(1):1. 2009. (S.T. Bates, F. Farruggia, E. Gilbert R. Gutierrez, D. Jenke, E. Makings, E. Manton, D. Newton, and L.R. Landrum)
Solanaceae Part Three: *Lycium*. CANOTIA 5(1):17. 2009. (F. Chiang and L.R. Landrum)
Solanaceae Part Four: *Physalis* and *Quincula*. CANOTIA 9:1-12. 2013. (L.R. Landrum, A. Barber, K. Barron, F.S. Coburn, K. Sanderford, and D. Setaro)
Solanaceae Part Five: *Chamaesaracha*. CANOTIA 9:13-15. 2013. (E. Manton)
Sparganiaceae JANAS 33(1):65. 2001. (J. Ricketson)
Sterculiaceae
Tamaricaceae
Thelypteridaceae CANOTIA 5(1):49. 2009. (G. Yatskievych and M.D. Windham)
Tiliaceae
Typhaceae JANAS 33(1):69. 2001. (J. Ricketson)
Ulmaceae JANAS 35(2):170. 2003. (J.W. Brasher)
Urticaceae JANAS 26(1):42. 1992. (D. Boufford)
Valerianaceae
Verbenaceae
Violaceae. JANAS 33(1):73. 2001. (R.J. Little; Fig. 17)
Viscaceae JANAS 27(2):241. 1994. (F.G. Hawksworth and D. Wiens)
Vitaceae
Zannichelliaceae
Zygophyllaceae (Fig. 17)